NWIFCA Technical, Science and Byelaw Committee

15th August 2023: 10:00 a.m.

Agenda Item 7 Annex A

MORECAMBE BAY COCKLE FISHERY REPORT 2023

Purpose: **To report on the results of the cockle survey and inspections that inform the decision on Morecambe Bay cockle fisheries.**

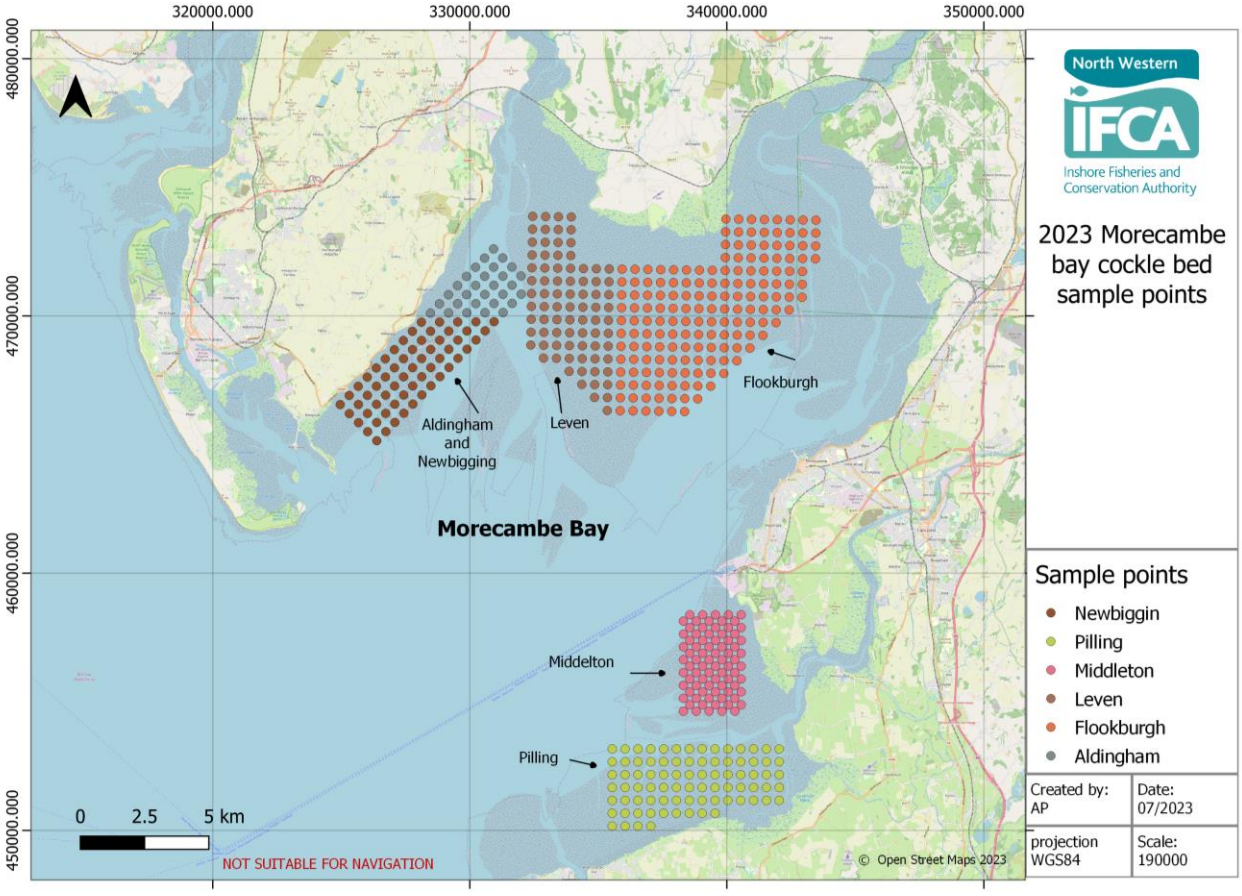
Recommendation:

1. **To accept the conclusions of this report.**
2. **To approve that the cockle beds in Morecambe Bay remain closed for the rest of the closed season, and that from the 1st of September they remain closed under Byelaw 3 paragraph 15.**

1. Morecambe Bay Cockle 2023 Results

Survey reports for all Morecambe Bay cockle beds were finalised on the 27th of July and are provided in Annex 1 of this report. This year officers collected and analysed over 14,500 cockles from 500 sample points across 7,700 ha of Morecambe Bay. Figure 1 shows the location and extent of sample points for the respective beds.

Figure 1. The location of sample points across Morecambe Bay cockle beds.



A summary of this year's survey results is provided in table 1.

Table 1. Biomass calculations of size, undersize and combined biomass of cockles on Morecambe Bay cockle beds 2023. *figures represent the max cockle biomass

Cockle bed	Date surveyed	Area (ha)	Size cockle (tonnes)	Undersize cockle (tonnes)	Total cockle biomass (tonnes)
Aldingham and Newbiggin	11th of July 2023	1096	535	2150	2685
Leven	17th of July 2023	1612	400	1450	1850
Flookburgh	4th & 5th of July 2023	2815	825	4250	5075
Warton Sands	15th of June 2023	na	na	na	Na
Middleton	20th & 25th of July 2023	732	475	325	800
Pilling	10th of July 2023	1475	800	4800	5600

When analysing results, NWIFCA look to answer the following questions which may assist in determining the stock levels, stock trends and HRA requirements.

1) What is the biomass of size and undersize cockle on individual beds and across the bay as a whole,
2) What is the density of size and undersize cockle on individual beds and across the bay, and
3) What is the composition of size classes on individual beds and across the bay as a whole,

Each element is important for determining which beds may be opened and bird food requirements.

Table 2 provides yearly maximum cockle biomass figures from 2017 to 2023. This year, there is an estimated and 3035 tonnes of size cockle and 12,975 tonne of undersize over 7730 hectares surveyed across Morecambe Bay.

Table 2. The yearly biomass of figures for size, undersize and total biomass of cockles on Morecambe Bay cockle beds from 2017 to 2023. *figures represent the max cockle biomass

Year	All surveyed Morecambe Bay cockle beds				Beds opened
	Area (ha)	Size cockle (tonne)	Undersize cockle (tonne)	Total cockle (tonne)	
2017	5177	6980	4230	11210	Flookburgh Leven Pilling
2018	6088	7000	12140	19140	Flookburgh Leven Pilling Newbigging
2019	6705	4635	12900	17535	Flookburgh Leven Pilling Newbigging
2020	8085	12580	3975	16555	Flookburgh Leven Pilling Newbigging
2021	7089	6450	955	7415	Pilling
2022	6582	3950	1990	5940	None
2023	7730	3035	12975	16010	TBC

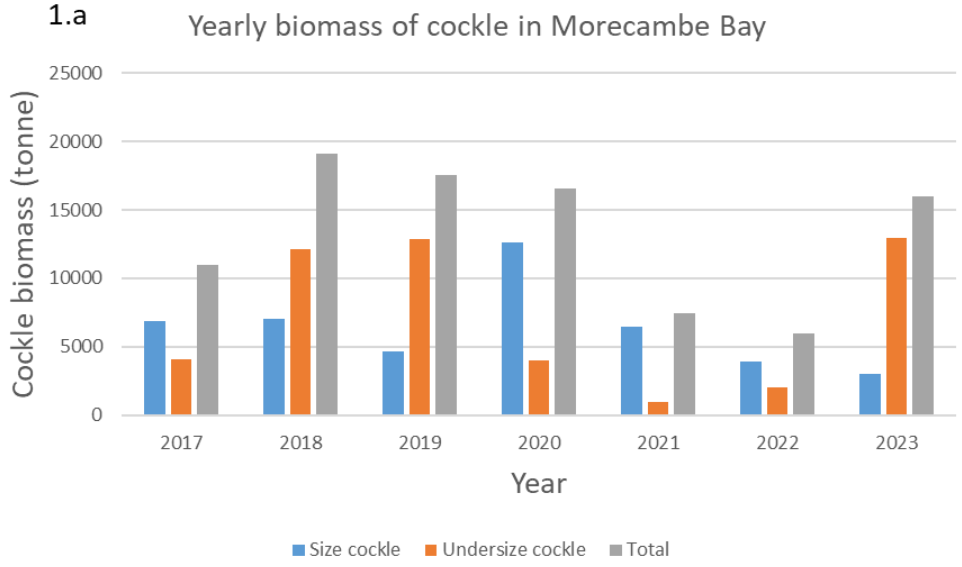
Figure 1 shows the data from table 1 in graphical form to demonstrate the trends in cockle biomass across Morecambe Bay since 2017, the composition of this year's cockle size classes, and the trends in density of cockle per m^2 across Morecambe Bay since 2017.

This year, the overall biomass of cockle has increased across Morecambe Bay from approximately 5,940 tonnes in 2022, to 16,010 tonnes (Figure 1.a). This increase is due to the six-fold rise in the biomass of undersize cockle from approximately 1900 tonne in 2022 to 12,975 tonnes this year.

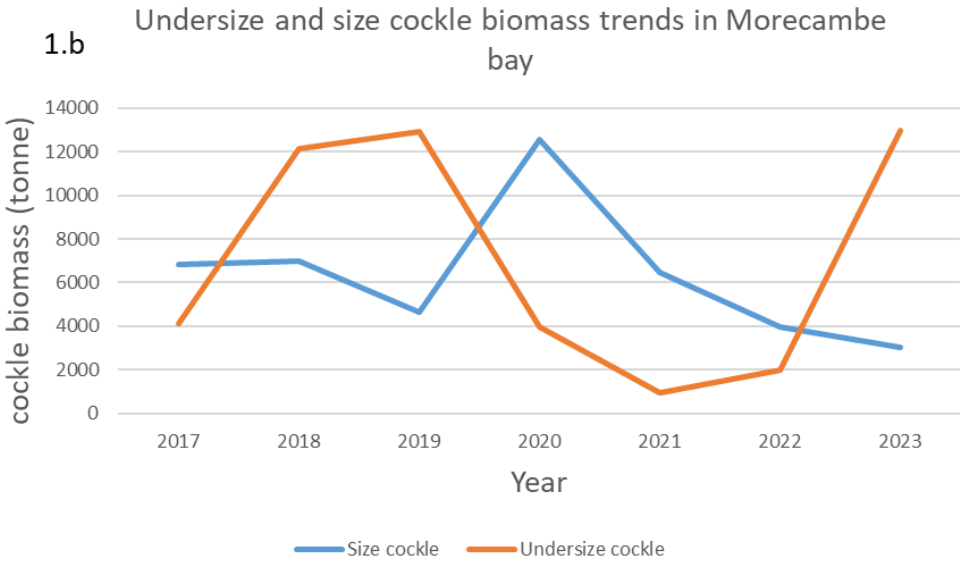
The total biomass of size cockle has decreased for the third year in a row, down to approximately 3035 tonnes (Figure 1.a). The biomass of size cockle is the lowest in Morecambe Bay since 2017.

Figure 1.b indicates the trend in the biomass of size (blue) and undersize (orange) cockle for Morecambe Bay as a whole. High levels of undersize cockle in 2018 and 2019 preceded an increase in the biomass of size cockle, one to two years later. Therefore, despite the low level of sizeable cockle present across the bay, the significant increase in undersize cockle is encouraging for future fisheries, as it will likely make the basis for the following years size fishery once it grows on.

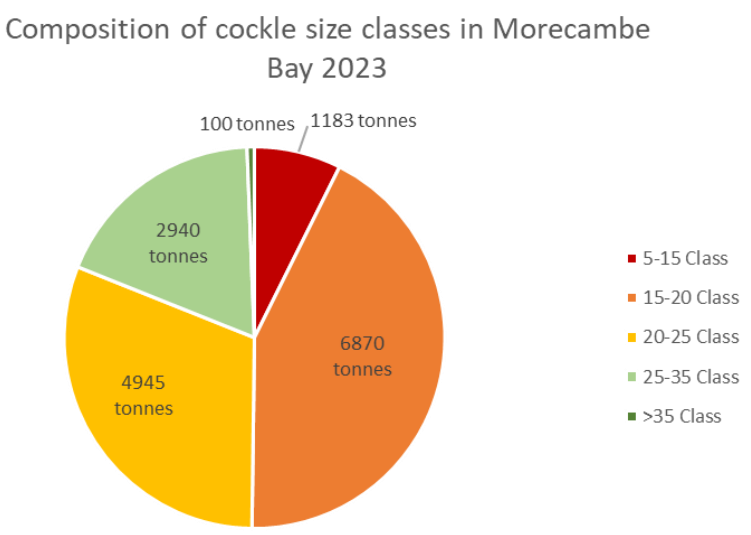
1.a


Yearly biomass of cockle in Morecambe Bay
Cockle biomass (tonne)
25000
20000
15000
10000
5000
0
2017
2018
2019
2020
2021
2022
2023
Year
Size cockle
Undersize cockle
Total

1.b


Undersize and size cockle biomass trends in Morecambe bay
cockle biomass (tonne)
14000
12000
10000
8000
6000
4000
2000
0
2017
2018
2019
2020
2021
2022
2023
Year
Size cockle
Undersize cockle

1.c


Composition of cockle size classes in Morecambe Bay 2023
100 tonnes
1183 tonnes
2940 tonnes
6870 tonnes
4945 tonnes
5-15 Class
15-20 Class
20-25 Class
25-35 Class
>35 Class

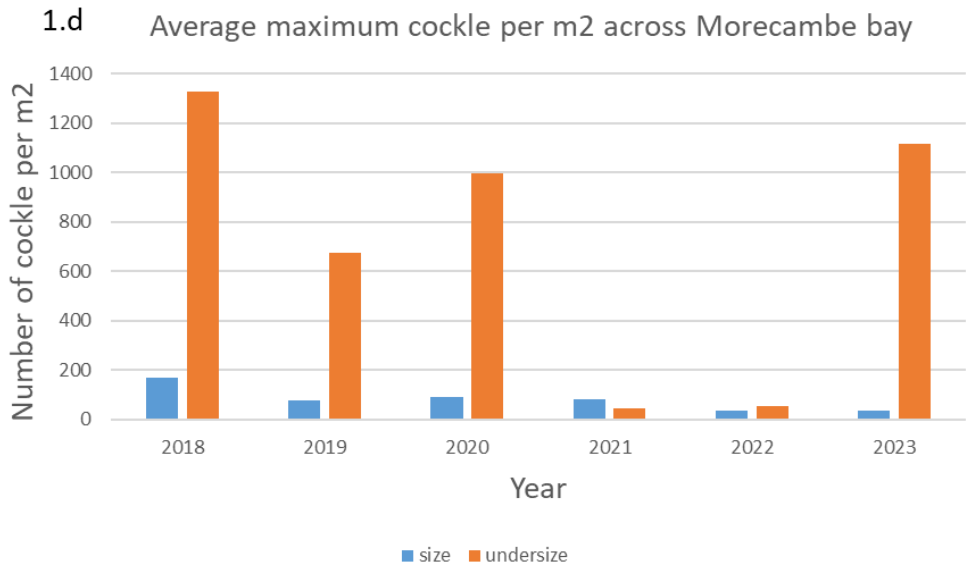


Figure 1. **Summary of Morecambe Bay cockle survey results from 2023**. 1.a) shows the yearly biomass of size, undersize and total cockle in Morecambe Bay from 2017 to 2023, 1.b) the relational trend in size and undersize cockle from 2017 to 2023, 1.c) the composition of cockle by size class across Morecambe Bay in 2023, and 1.d) the average maximum cockle per m^2 across Morecambe Bay from 2018 to 2023.

Figure 1.c shows the biomass of each size class of cockle in Morecambe Bay (cockle size relates to length of shell). This year, cockle in the 15 to 20 mm size range constitute a significant portion of the total cockle biomass.

Figure 1.d shows the maximum density of cockles per m^2 across all Morecambe Bay cockle beds combined. The densities of individual beds are provided in Annex 2 of this report. This year, the maximum density of size is still very low at 36 per m^2, (mean density 5 per m^2) relatively similar to 2022 densities at 35 per m^2 (mean density 5.8 per m^2). The density of undersize however has significantly increased from approximately 52 per m^2 (mean density 9.2 per m^2) to 1114 per m^2 (mean density 89 per m^2).Note these are maximum figures, and the mean levels are significantly lower.

Less than 5mm cockle are not used in the undersize density or biomass figures due to the highly variable nature of survivability.

2. Individual beds

An analysis of survey data for each of the main cockle beds in Morecambe Bay is presented below. Morecambe Bay is considered in its entirety due to the overarching SPA and SAC designation of the site, however, individual beds may be opened if they meet the HRA requirements for the site as a whole. Survey results for each cockle bed are provided in Annex 1.

Figure 2 shows the size biomass of size cockle for each surveyed Morecambe Bay cockle bed from 2017 to 2023, and which beds were opened for fishing that same year. For all beds, apart from Middleton, there has been a further decrease in the biomass of size mussel since 2022. All beds were closed in 2022 due to low cockle biomass.

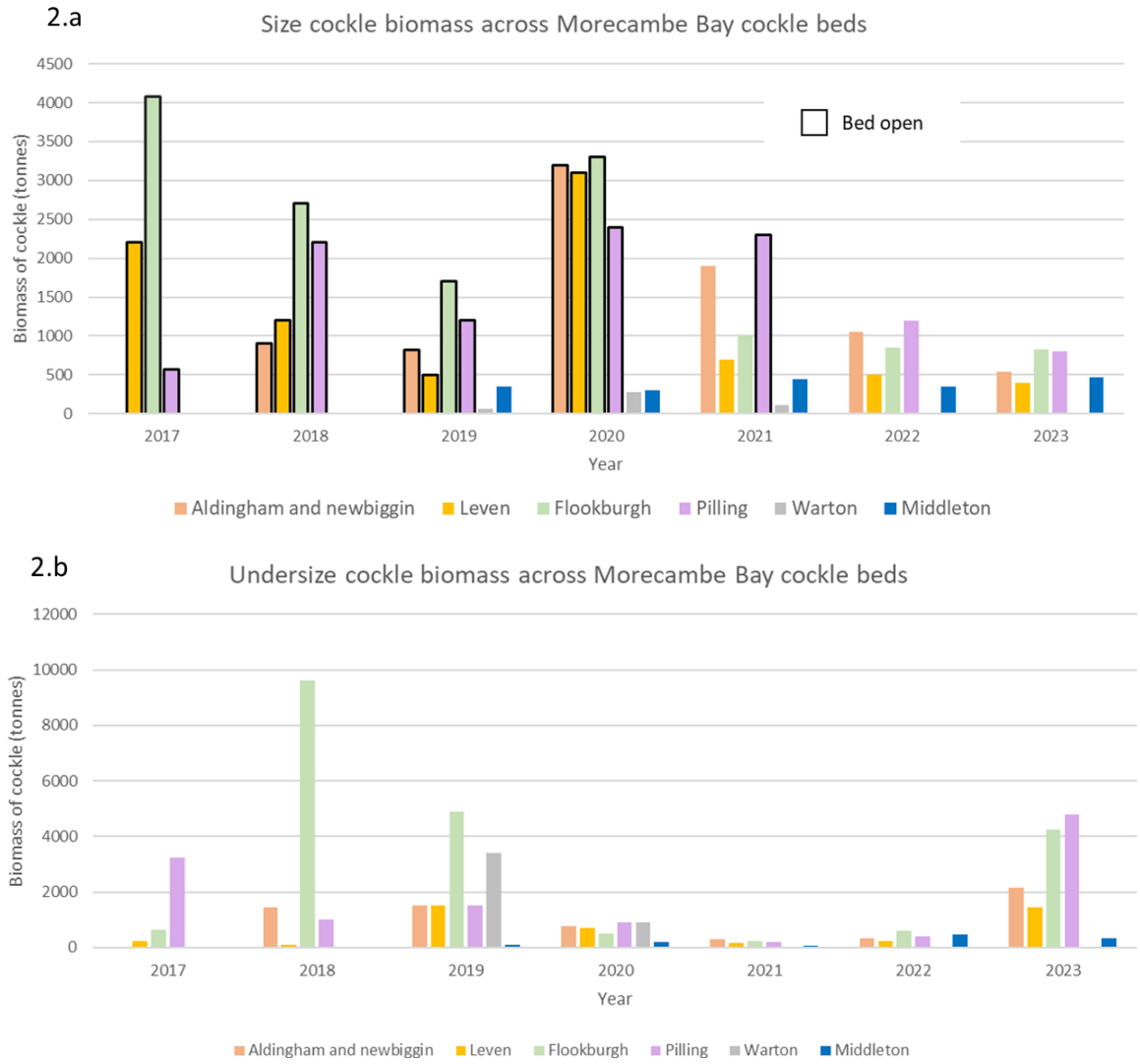
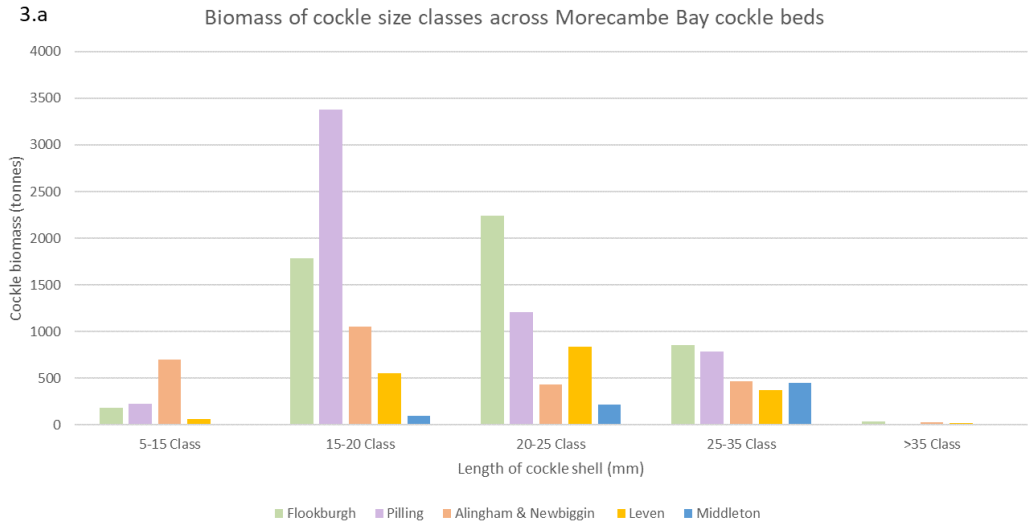


Figure 2. Biomass of size cockles on the individual Morecambe Bay cockle beds from 2017 to 2023, 2.a) the biomass of size cockle from 2017 to 2023 for all surveyed beds with the corresponding open beds, and 2.b) the biomass of undersize cockle on all surveyed beds from 2017 to 2023.

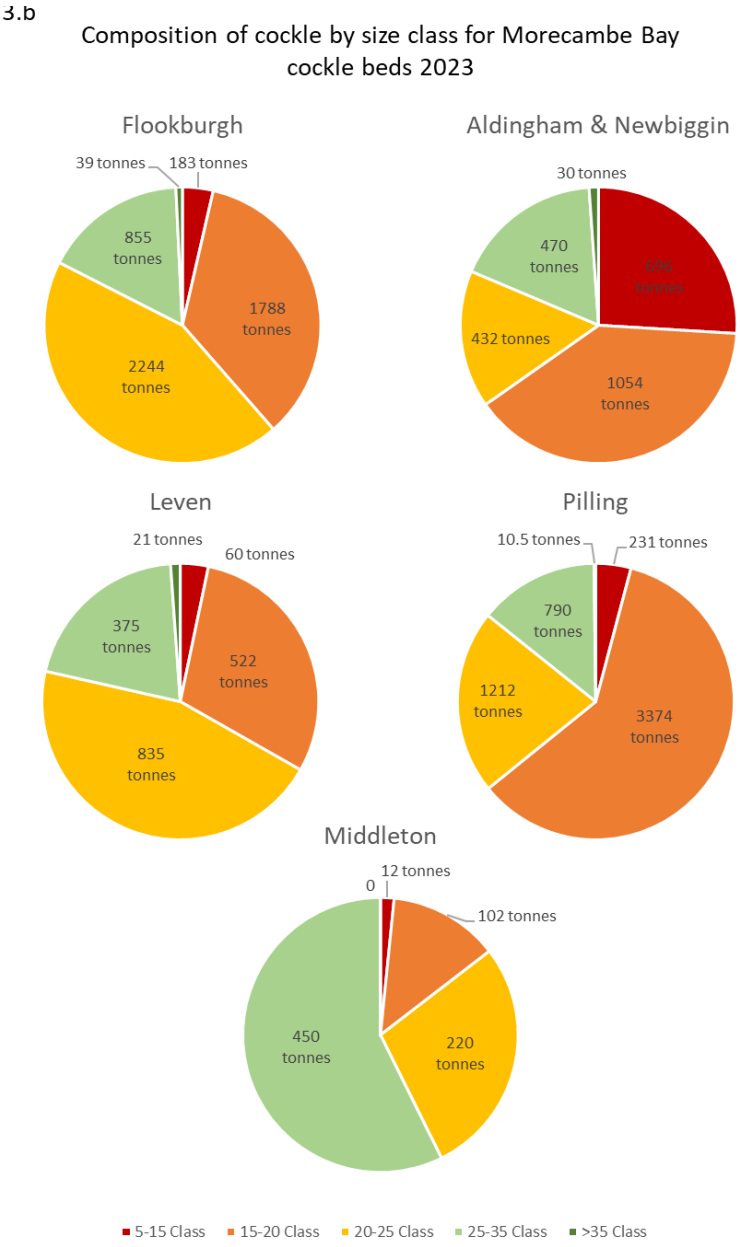
Although the biomass of size cockle is low, there has been a large increase in undersize cockle particularly in the 15-20 mm and 20-25 mm size classes. Typically, size cockle falls within the 25-30mm+ category, though there is some inter-bed variability.

Figure 3.a shows the biomass of cockles in each size class for the main Morecambe Bay cockle beds. For Pilling, Aldingham and Newbigging, and Flookburgh beds, cockles in the 15-20mm and 20-25mm size classes make up a large proportion of their total biomass. Should these cockles survive the winter, it is likely a proportion will grow on to reach size for the following year. The biomass of size cockle (predominantly 25-30+mm) is consistently low across all beds.

3.a


Biomass of cockle size classes across Morecambe Bay cockle beds
Cockle biomass (tonnes)
4000
3500
3000
2500
2000
1500
1000
500
0
5-15 Class
15-20 Class
20-25 Class
25-35 Class
>35 Class
Length of cockle shell (mm)
Flookburgh
Pilling
Alingham & Newbiggin
Leven
Middleton

3.b


Composition of cockle by size class for Morecambe Bay cockle beds 2023
Flookburgh
39 tonnes
183 tonnes
855 tonnes
1788 tonnes
2244 tonnes
Aldingham & Newbiggin
30 tonnes
470 tonnes
432 tonnes
1054 tonnes
Leven
21 tonnes
60 tonnes
375 tonnes
522 tonnes
835 tonnes
Pilling
10.5 tonnes
231 tonnes
790 tonnes
1212 tonnes
3374 tonnes
Middleton
0
12 tonnes
102 tonnes
450 tonnes
220 tonnes
5-15 Class
15-20 Class
20-25 Class
25-35 Class
>35 Class

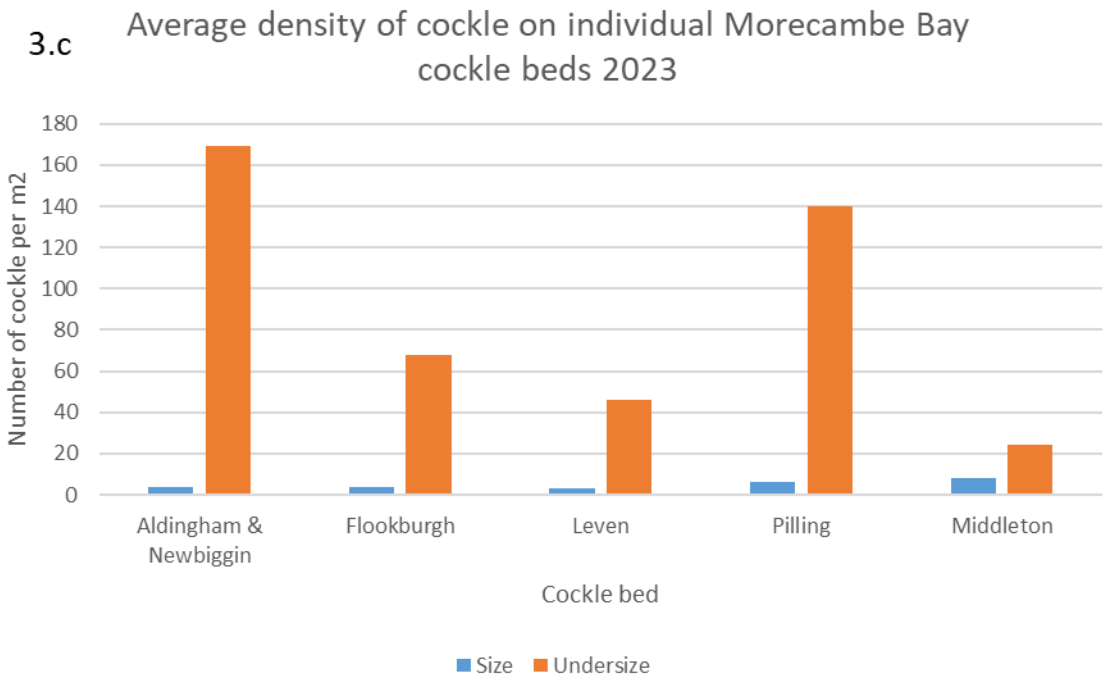


Figure 3. Biomass of cockles on the main Morecambe Bay cockle beds. 3.a) a comparison of the biomass of cockles across each bed in 2023, 3.b) the composition of cockle by size class for each bed, and 3.c) the density of cockle on each cockle bed in Morecambe Bay in 2023.

Figure 3.c shows the average density of both size and undersize cockles per m^2 across each cockle bed. All beds have very low-density levels of sizeable cockle, though there is higher densities of undersize this year in comparison to the past 3 years.

3. Summary

The results of the 2023 Morecambe bay cockle survey show:

1) Very low biomass of size cockle across all beds and Morecambe bay as a whole
2) Very low densities of size cockle across all beds and Morecambe bay as a whole
3) Increased biomass of undersize cockle across all beds and Morecambe bay as a whole
4) Increased densities of undersize cockle across all beds and Morecambe bay as a whole
5) 15mm + size category of cockle constitutes a significant portion of the undersize cockle biomass

4. Morecambe Bay cockle fishery recommendation considerations

Over the last 2-years, NWIFCA has recommended that all cockle beds be closed due to concerns over the very low cockle biomass and, in particular, the low amount of undersize stock available to grow on and support a fishery in the following year.

This year, though there is a significant increase in the biomass of undersize cockles across the bay, both biomass and density of size cockles remain at very low levels.

There is the potential that some undersize cockles in the 20-25mm category may grow on to reach size this summer, however, it is not possible from the data to predict what percentage will grow to size, and how this will increase either the biomass or density of the size stock.

Due to the very low biomass and densities of size cockle, NWIFCA recommend that Morecambe Bay cockle beds remain closed as of 1st September 2023.

However, there is good evidence that should the volume of undersize cockle survive the winter, and grow to size – based on similar trends seen in 2018-2020, that a fishery may be viable in the following year.

It must be noted that all figures are maximum estimates, and the true value may fall lower than those presented here.

As has been previously discussed, there are several additional considerations when proposing the opening or closing of a fishery, which as yet do not have established parameters:

1) Bird food requirements for SPA designated species
2) Minimum cockle density spawning requirements
3) Location of cockle brood stock for re-seeding
4) An agreed threshold limit beyond which the fishery will remain closed
5) Criteria for selecting which beds should open in the event of low stock numbers.

NWIFCA does not have an agreed minimum total cockle biomass for Morecambe Bay from which to recommend the opening or closing of a fishery. There are outstanding questions on the requirements of birds for food, location of potential sources of cockle brood stock for Morecambe Bay and cockle survivability of juvenile cockle is highly reliant on environmental factors. Given these uncertainties and the low levels of sizeable stock across Morecambe Bay, we cannot recommend that the Morecambe Bay cockle beds are opened on 1st September 2023.

Closing the fishery would aim to allow the undersize stock that survive the winter, the opportunity to grow on to size in 2024 and contribute to a following years fishery.

Annex 1.
Cockle survey reports

Aldingham and Newbiggin Cockle Survey 11-07-23

Officers present: ID, JH, MC, GG
Tides: LW 13:00 2.3m (Liverpool Tides)

Survey method - Jumbo and 0.5m² quadrat
51 stations were sampled from a 500m grid. Most of the Aldingham survey location could not be accessed due to the Leven channel being closer to the shoreline. The majority of the cockle is between 10-20mm in length from a 2022 cockle settlement. Size cockle is relatively low in density across the bed. There is evidence of a 2023 cockle settlement across a number of survey stations.

Means

Means were calculated from all stations with zero counts on the edge of the bed removed. Less than 5mm cockle was not used in the undersize figures due to the high variable survivability of cockle at this small size but has been included as a separate figure.

Newbiggin:

Mean number of size cockle	4 per m²	(min 0, max 22)
Mean number of undersize cockle	169 per m²	(min 0, max 1300)
Mean number of 0-5mm cockle	26 per m²	(min 0, max 200)
Mean weight of size cockle kg/m²	0.053 kg/m²	(min 0, max 0.476)
Mean number of undersize cockle kg/m²	0.218 kg/m²	(min 0, max 1.612)

Aldingham:

Mean number of size cockle	2 per m²	(min 0, max 8)
Mean number of undersize cockle	15 per m²	(min 0, max 56)
Mean number of 0-5mm cockle	26 per m²	(min 0, max 100)
Mean weight of size cockle kg/m²	0.027 kg/m²	(min 0, max 0.078)
Mean number of undersize cockle kg/m²	0.039 kg/m²	(min 0, max 0.097)

Maps

Maps were created showing the overall survey area, density of size cockle, density of undersize cockle (excluding cockles in the 0-5mm size range) the density of the 0-5mm size class, the frequency of size classes, the size of the pie chart indicates the total density of cockles present, and the weight of undersize and size cockle.

Biomass

	Area (ha)	Size Cockle (tonnes)[1]	Undersize Cockle (tonnes)[2]
Newbiggin	**959**	**500**	**2100**
Aldingham	**137**	**35**	**50**

[1]In regards to biomass size cockle defined as cockle which will not pass through a square gauge 20 x 20mm in size.
[2]The biomass of undersize cockle does not include any estimates of cockle less than 5mm due to the high variability of survival of this size class.

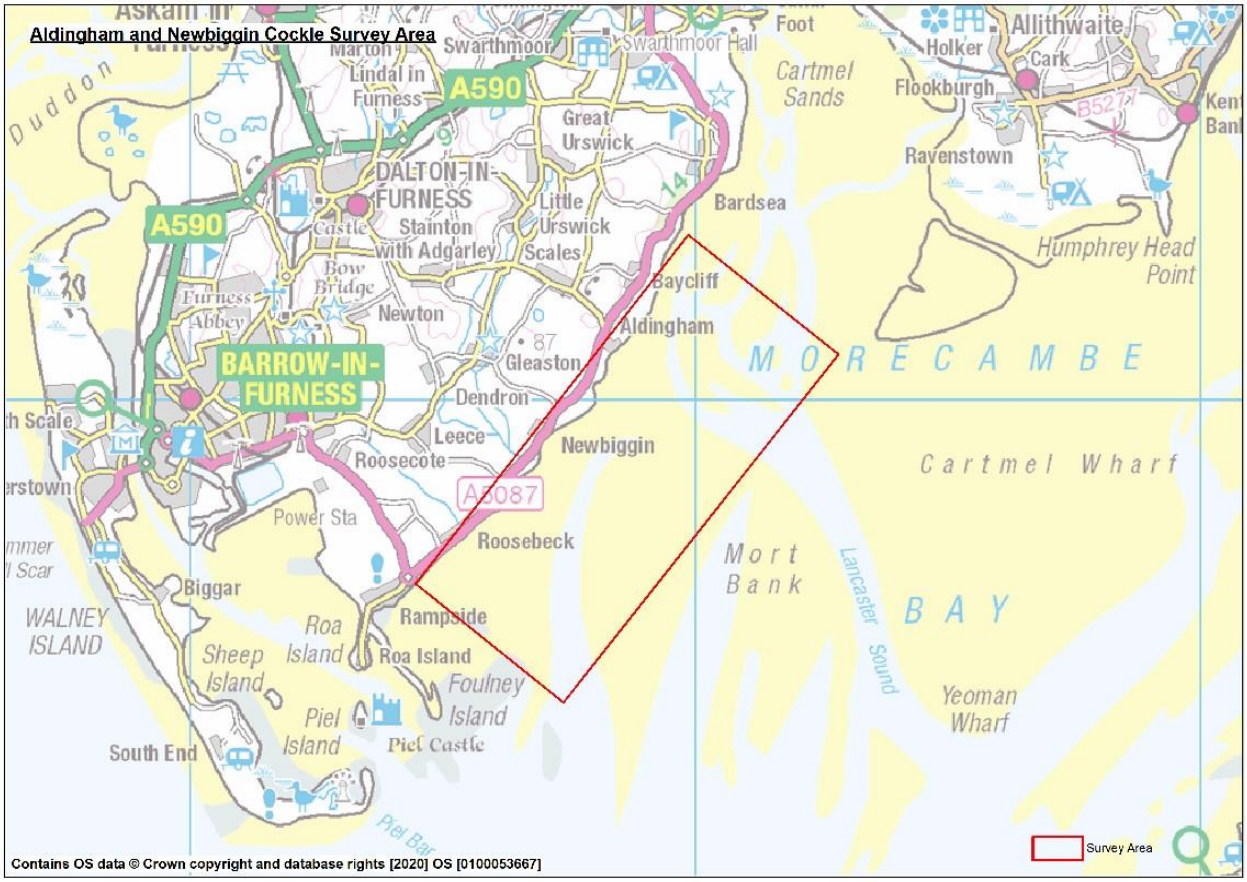


Figure 1. Illustration of position of Aldingham and Newbiggin Survey Area

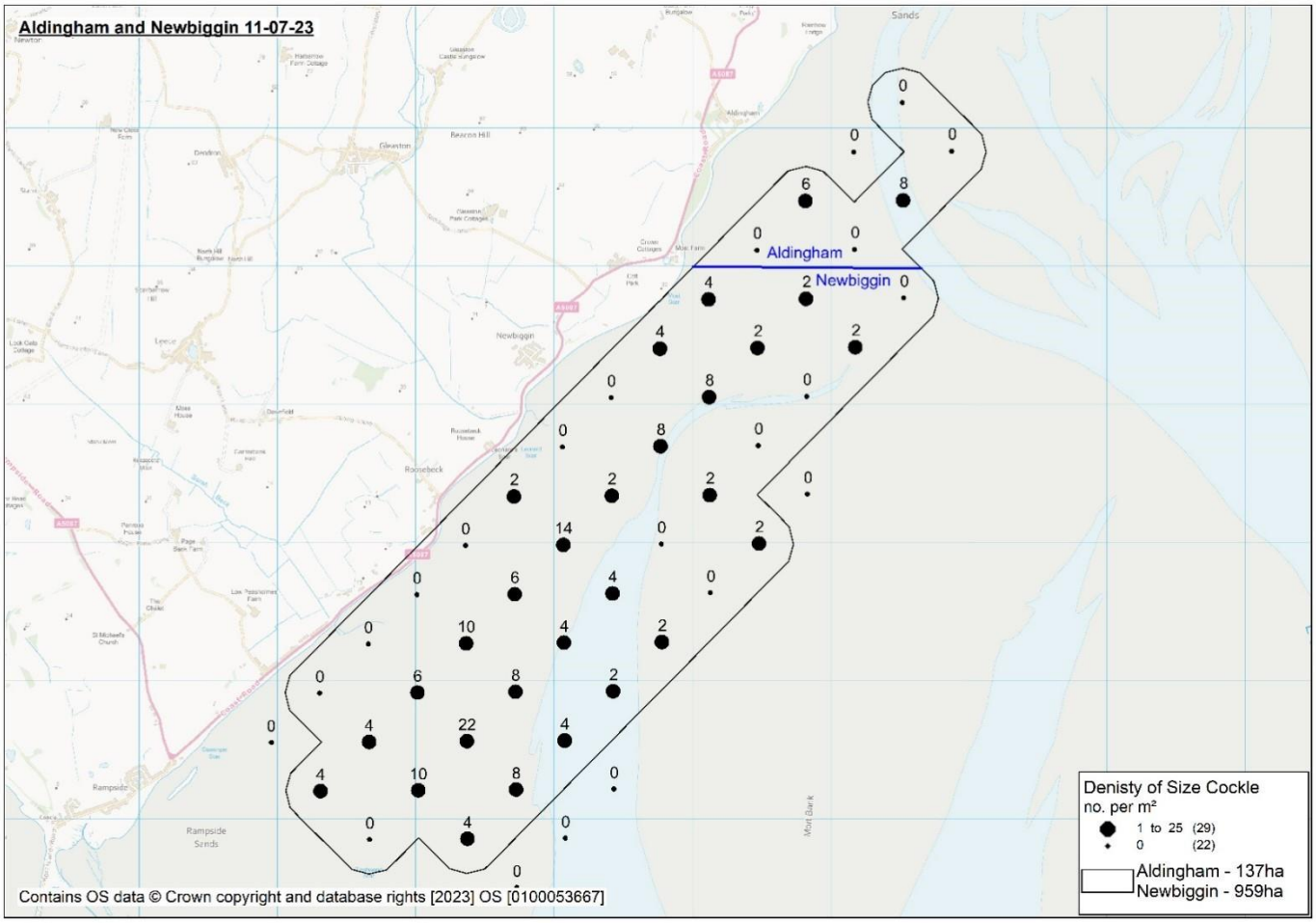


Figure 2. Density of size cockle per m² Aldingham and Newbiggin July 2023

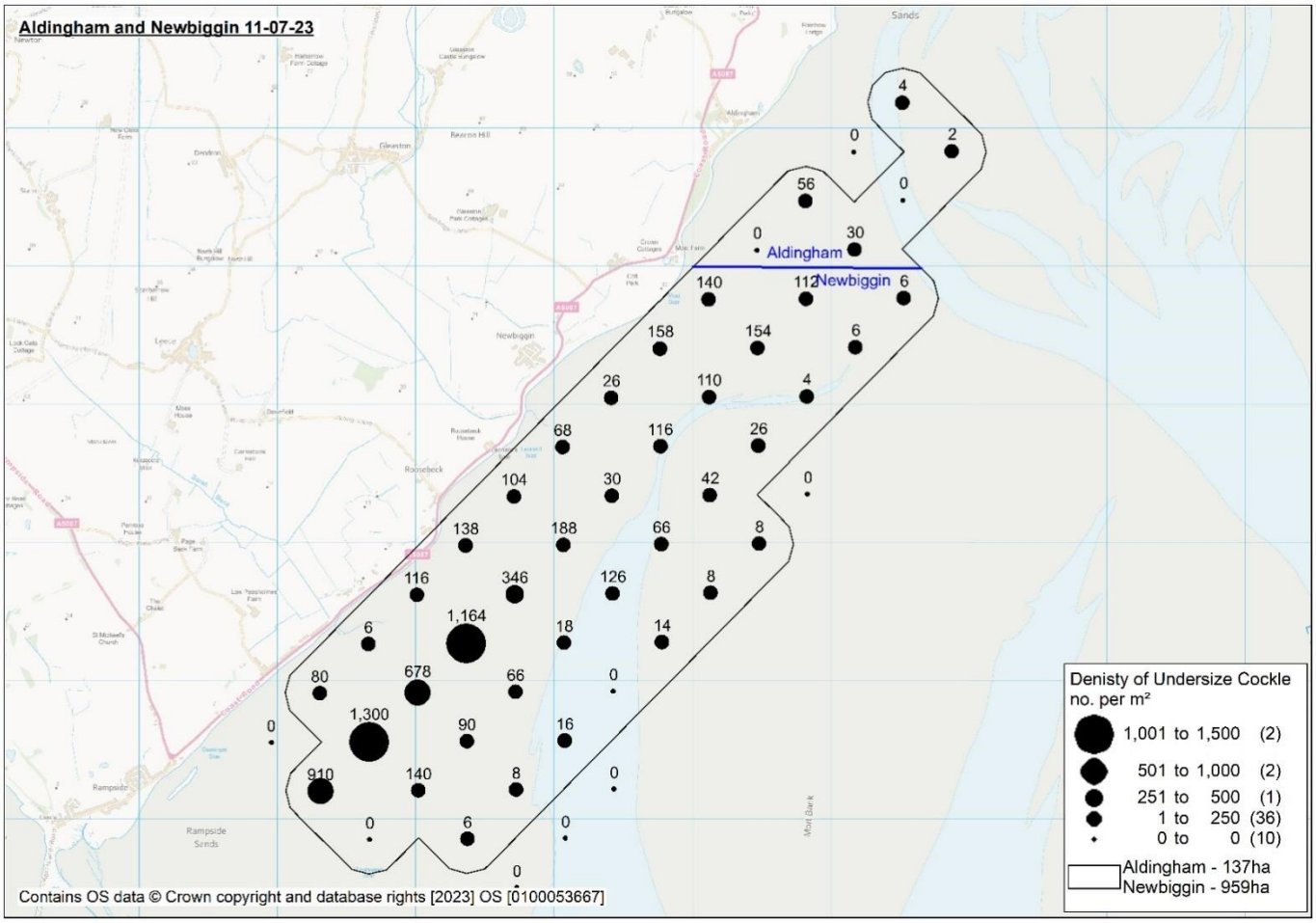


Figure 3. Density of undersize cockle per m² Aldingham and Newbiggin July 2023

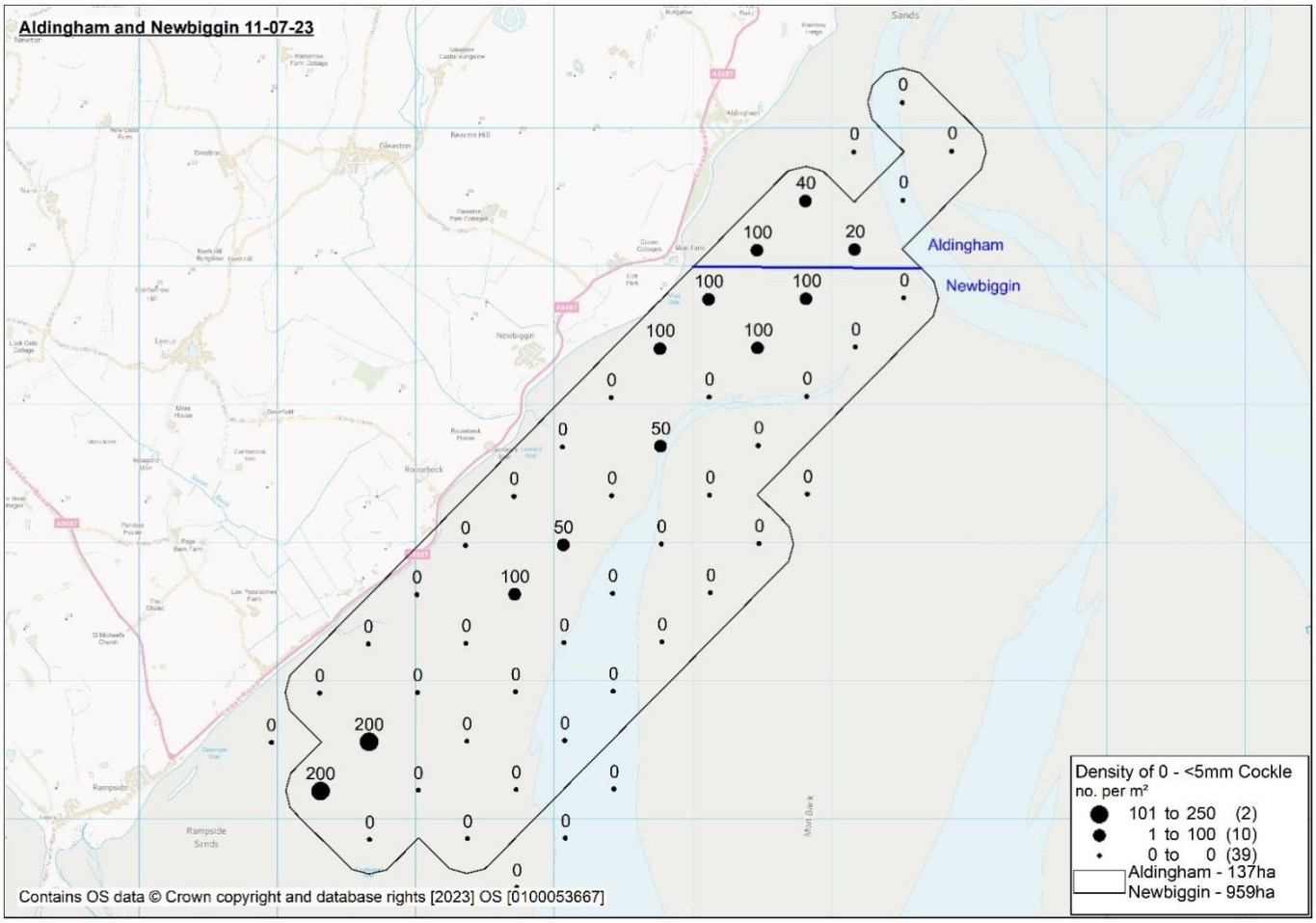


Figure 5. Density of 0-5mm cockle per m² Aldingham and Newbiggin July 2023

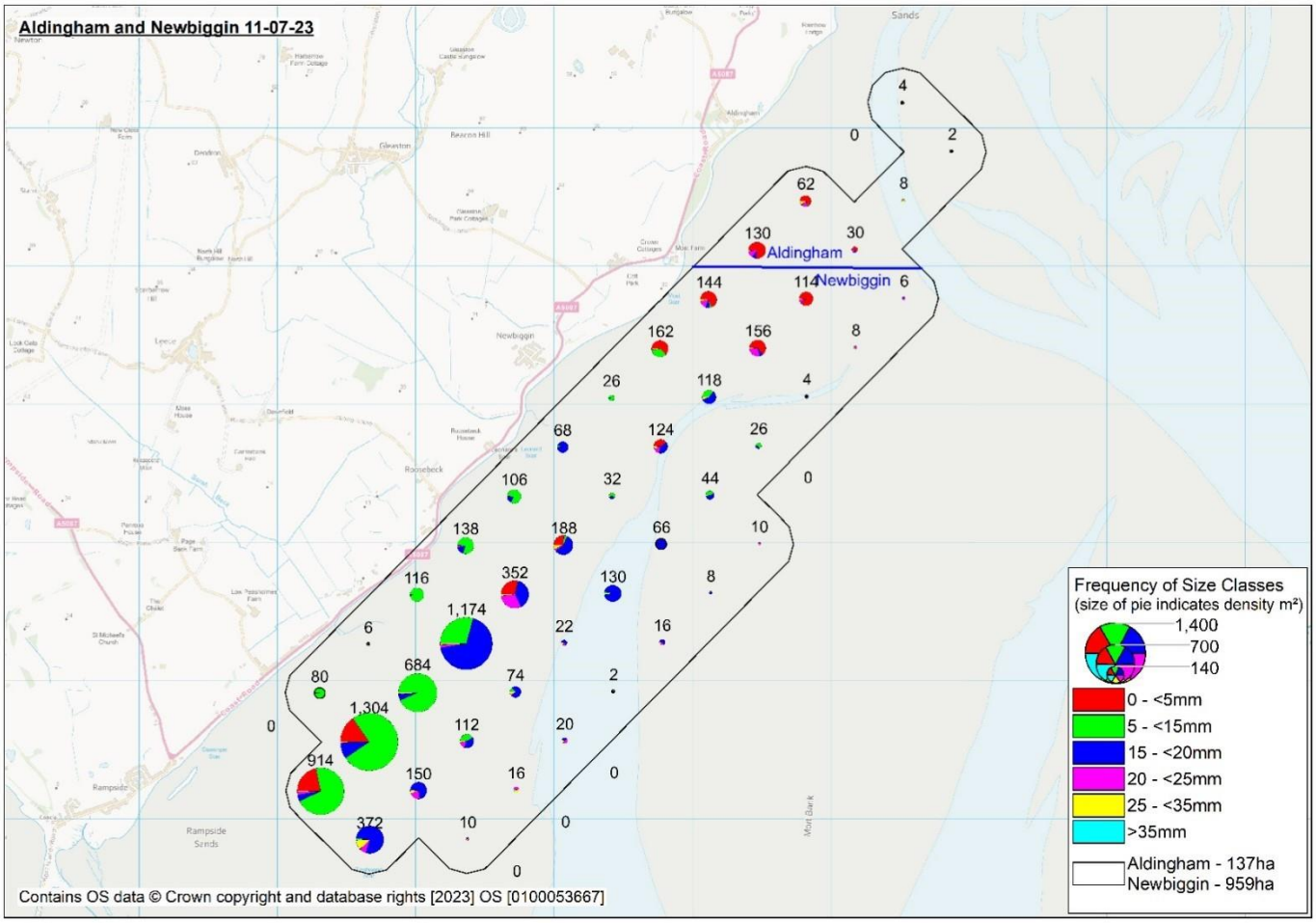


Figure 4. Frequency of size classes of cockle per m² Aldingham and Newbiggin July 2023

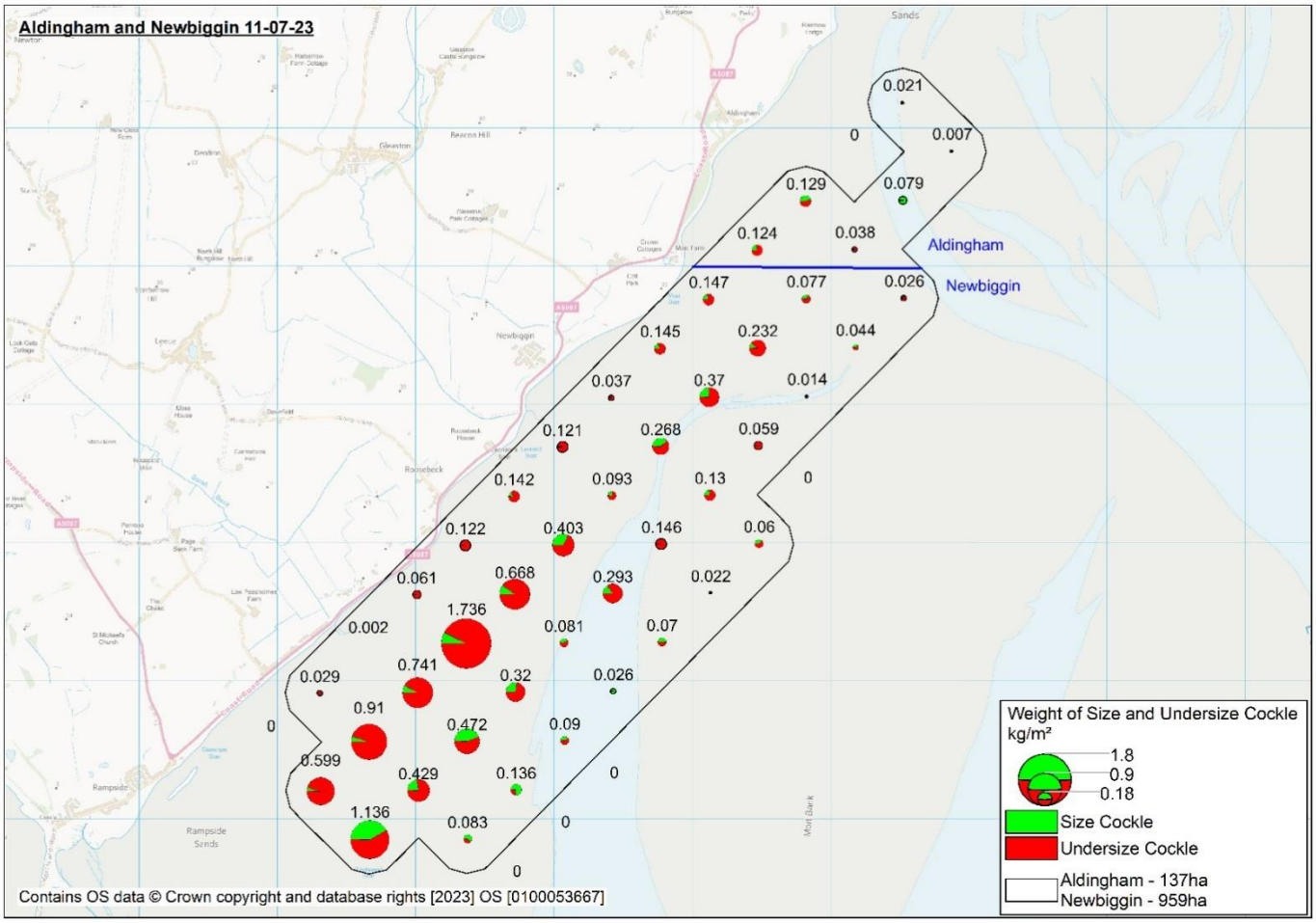


Figure 6. Weight of size and undersize cockle kg/m² at Aldingham and Newbiggin July 2023.

Flookburgh Cockle Survey 4th & 5th July 2023

Officers present: ID, AG, JH, MC
Tides: 04-07-23 LW 19:23 1.5m (Liverpool Tides)
05-07-23 LW 20:11 1.4m (Liverpool Tides)

Survey method - Jumbo and 0.5m² quadrat

135 stations were sampled from a 500m grid, with an additional 14 stations extending the grid to ensure full coverage of the bed. The majority of the cockle is between 15-20mm in length from a 2022 cockle settlement. Size cockle is relatively low in density with only one station having higher density at 66 m². There is evidence of a 2023 cockle settlement across a number of survey stations.

Means

Means were calculated from all stations with zero counts on the edge of the bed removed. Less than 5mm cockle was not used in the undersize figures due to the high variable survivability of cockle at this small size but has been included as a separate figure.

Mean number of size cockle	4 per m²	(min 0, max 66)
Mean number of undersize cockle	68 per m²	(min 0, max 590)
Mean number of 0-5mm cockle	14 per m²	(min 0, max 200)
Mean weight of size cockle kg/m²	0.030 kg/m²	(min 0, max 0.171)
Mean number of undersize cockle kg/m²	0.152 kg/m²	(min 0, max 1.072)

Maps

Maps were created showing the overall survey area, density of size cockle, density of undersize cockle (excluding cockles in the 0-5mm size range) the density of the 0-5mm size class, the frequency of size classes, the size of the pie chart indicates the total density of cockles present, and the weight of undersize and size cockle.

Biomass

	Area (ha)	Size Cockle (tonnes)[1]	Undersize Cockle (tonnes)[2]
Flookburgh	**2815**	**825**	**4250**

[1]In regards to biomass size cockle defined as cockle which will not pass through a square gauge 20 x 20mm in size.
[2]The biomass of undersize cockle does not include any estimates of cockle less than 5mm due to the high variability of survival of this size class.

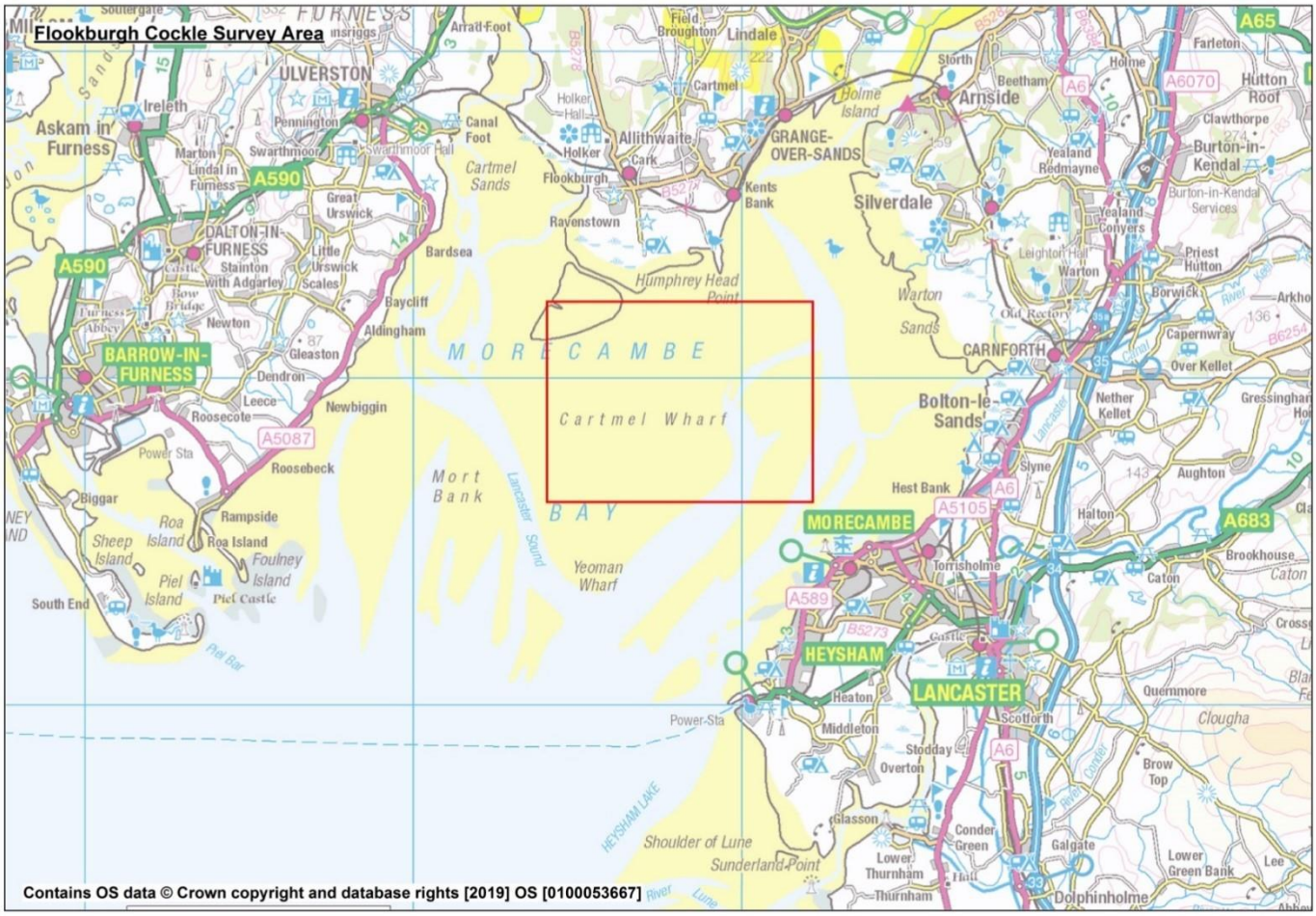


Figure 1. Illustration of position of Flookburgh Survey Area

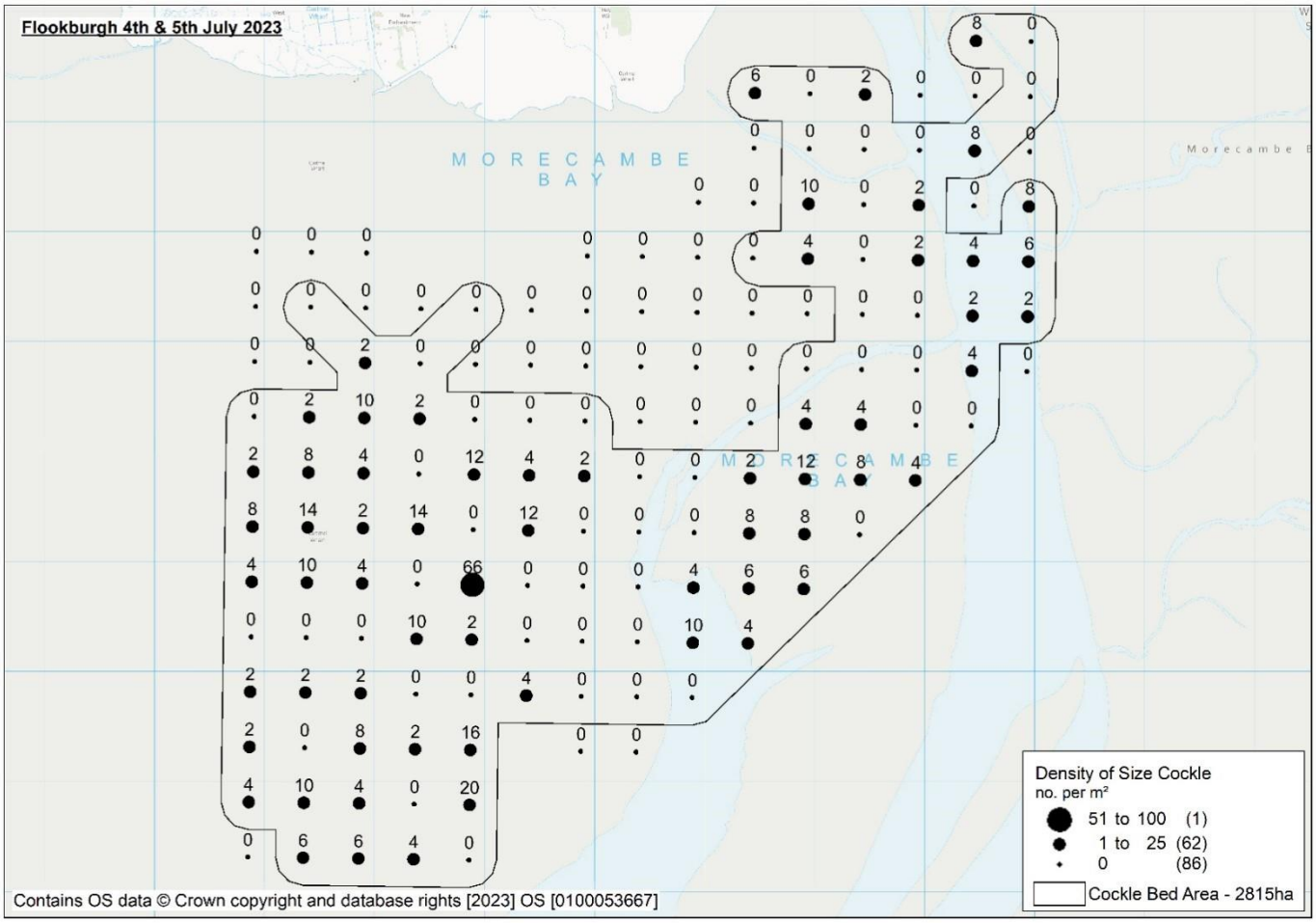


Figure 2. Density of size cockle per m² Flookburgh July 2023.

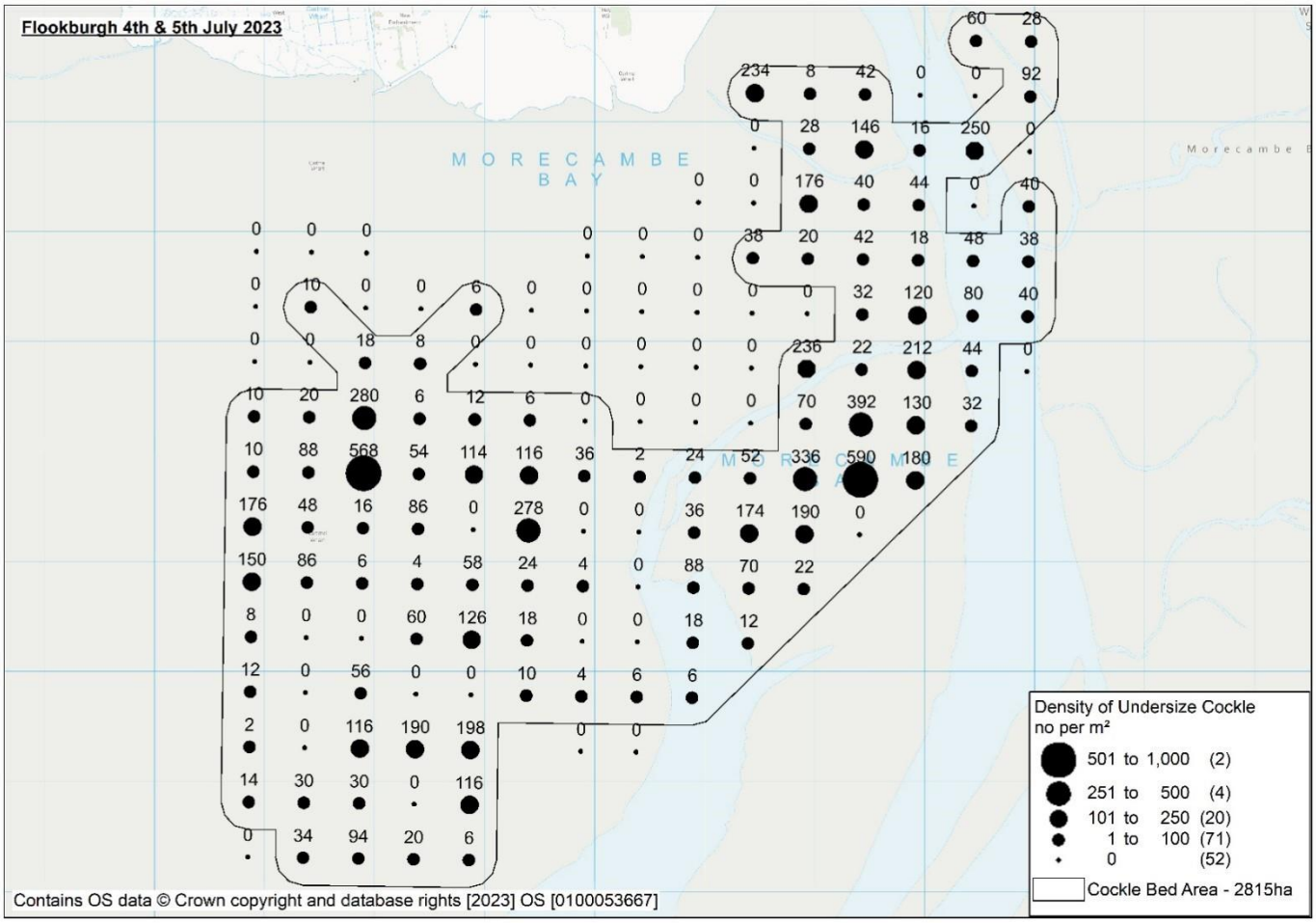


Figure 3. Density of undersize cockle per m² Flookburgh July 2023.

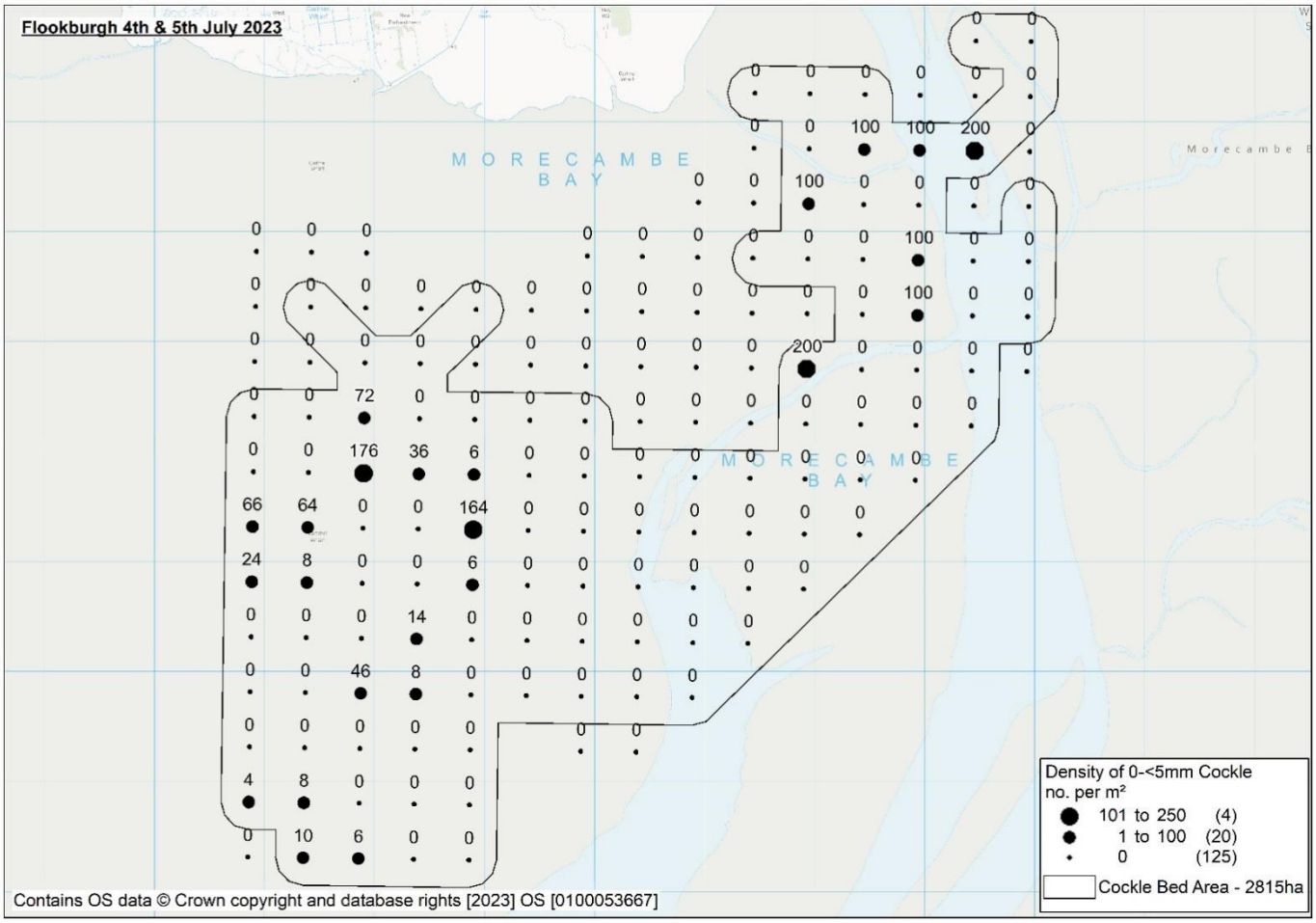


Figure 4. Density of 0-5mm cockle per m² Flookburgh July 2023.

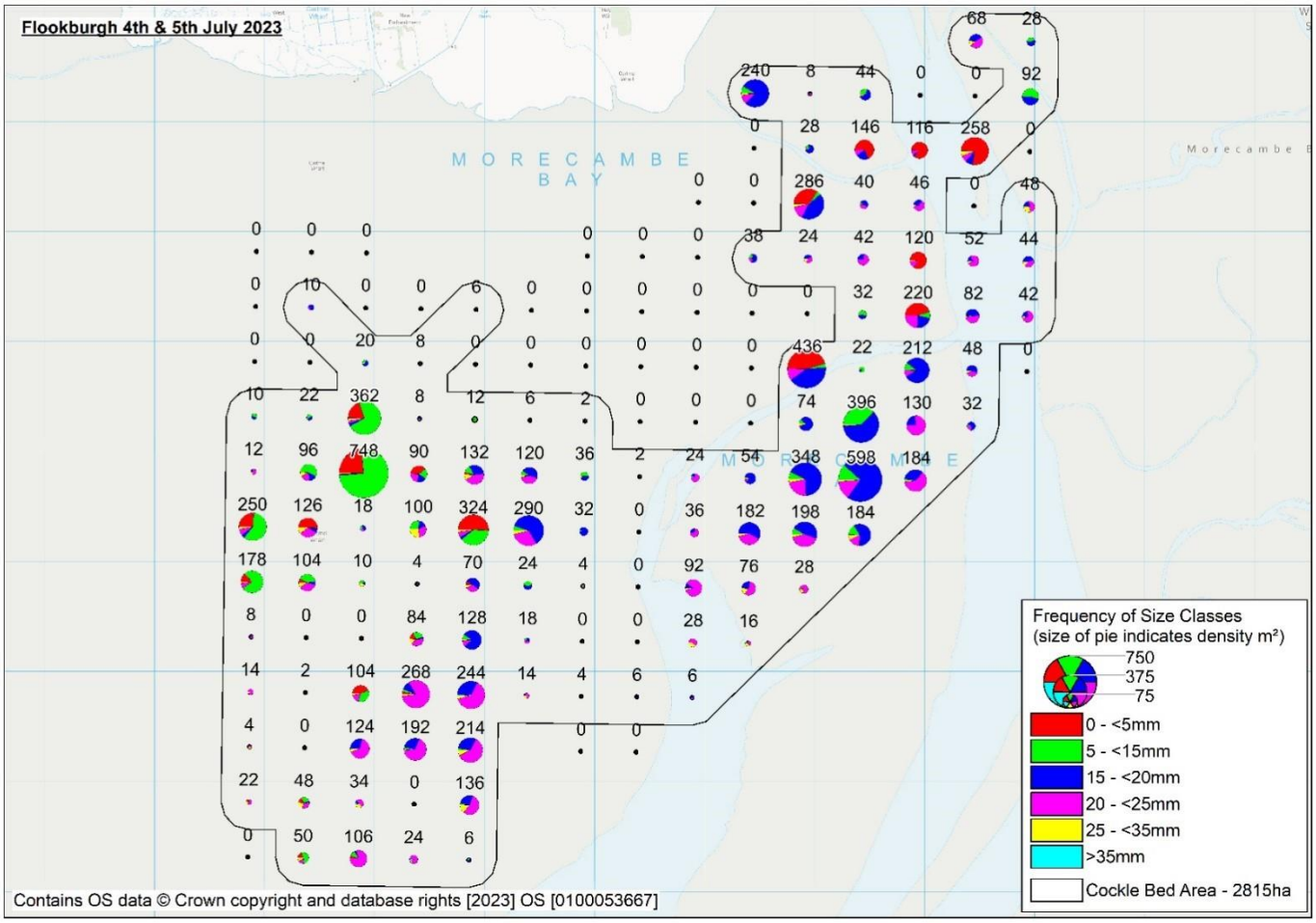


Figure 5. Frequency of size classes of cockle per m² Flookburgh July 2023.

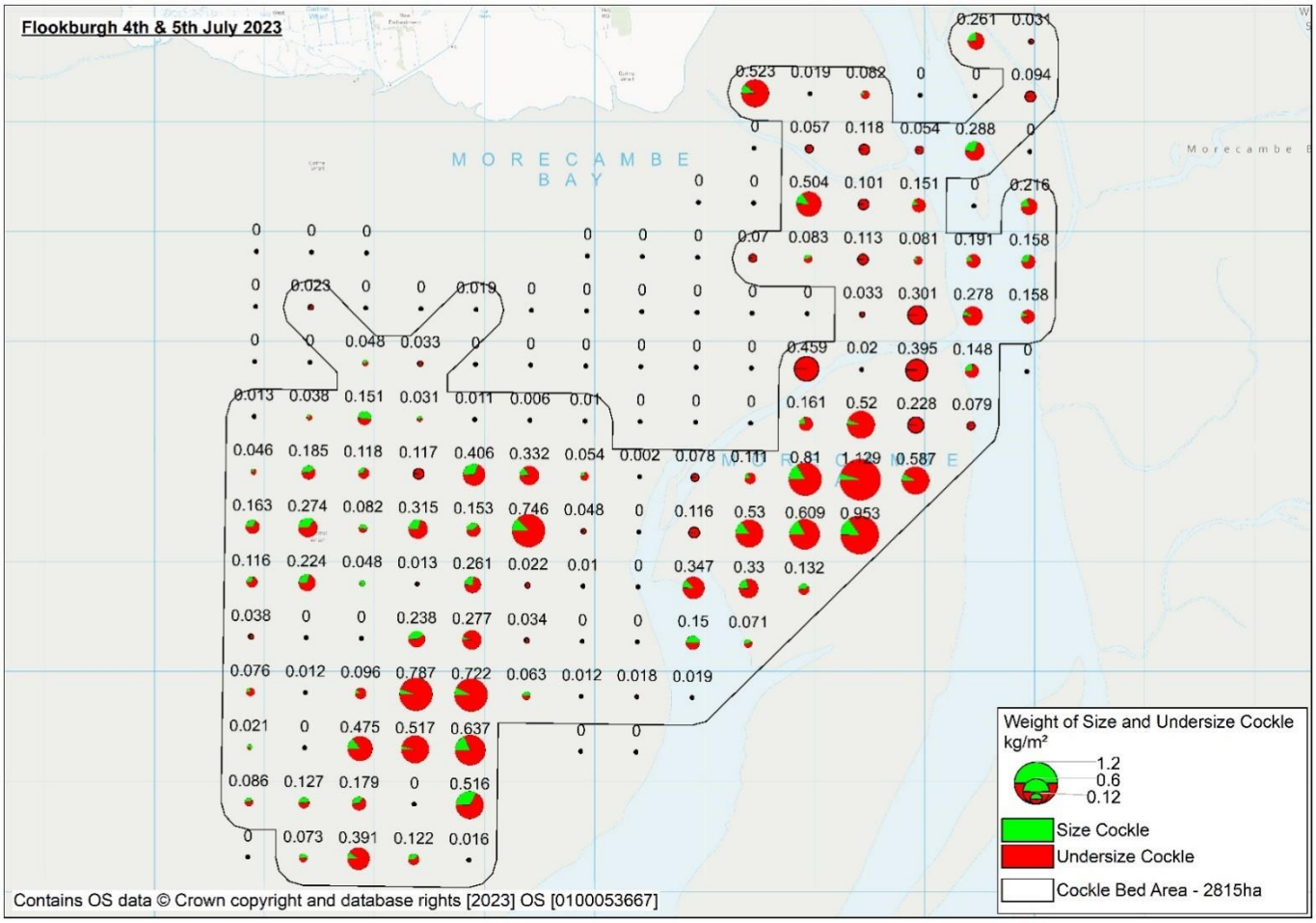


Figure 6. Weight of size and undersize cockle kg/m² at Flookburgh July 2023.

Leven Cockle Survey 17-07-23

Officers present: ID, AP, JH, GG
Tides: LW 18:27 2.4m (Liverpool Tides)

Survey method - Jumbo and 0.5m² quadrat

73 stations were sampled from a 500m grid. There was a wide range of cockle sizes across the bed from < 5mm to > 35mm. Size cockle is relatively low in density across the bed. There is evidence of a 2023 cockle settlement across a number of survey stations.

Means

Means were calculated from all stations with zero counts on the edge of the bed removed. Less than 5mm cockle was not used in the undersize figures due to the high variable survivability of cockle at this small size but has been included as a separate figure.

Mean number of size cockle	3 per m²	(min 0, max 24)
Mean number of undersize cockle	46 per m²	(min 0, max 472)
Mean number of 0-5mm cockle	37 per m²	(min 0, max 400)
Mean weight of size cockle kg/m²	0.025 kg/m²	(min 0, max 0.264)
Mean number of undersize cockle kg/m²	0.089 kg/m²	(min 0, max 0.508)

Maps

Maps were created showing the overall survey area, density of size cockle, density of undersize cockle (excluding cockles in the 0-5mm size range) the density of the 0-5mm size class, the frequency of size classes, the size of the pie chart indicates the total density of cockles present, and the weight of undersize and size cockle.

Biomass

	Area (ha)	Size Cockle (tonnes)[1]	Undersize Cockle (tonnes)[2]
Leven	**1612**	**400**	**1450**

[1]In regards to biomass size cockle defined as cockle which will not pass through a square gauge 20 x 20mm in size.
[2]The biomass of undersize cockle does not include any estimates of cockle less than 5mm due to the high variability of survival of this size class.

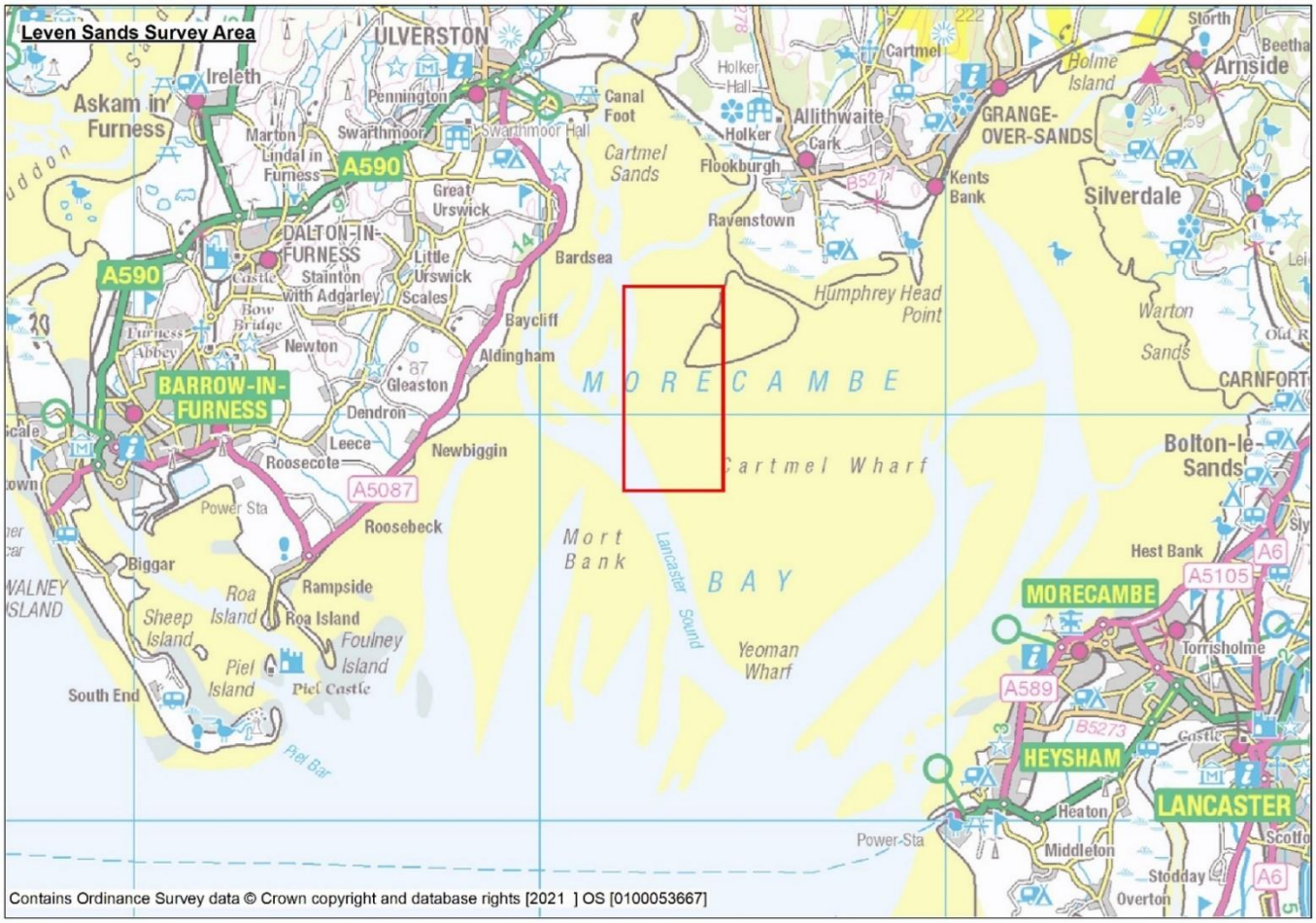


Figure 1. Illustration of position of Leven Survey Area

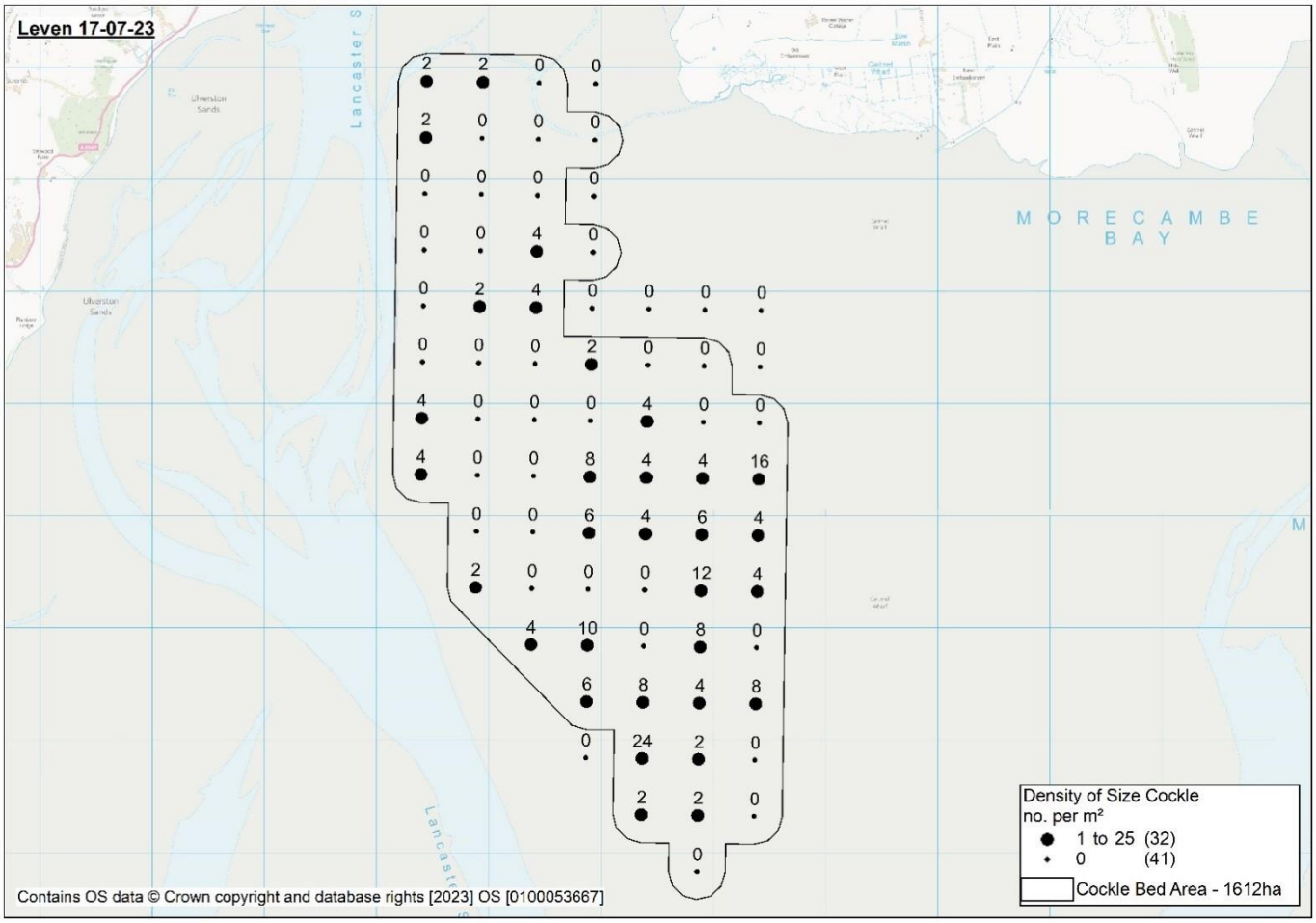


Figure 2. Density of size cockle per m² Leven July 2023

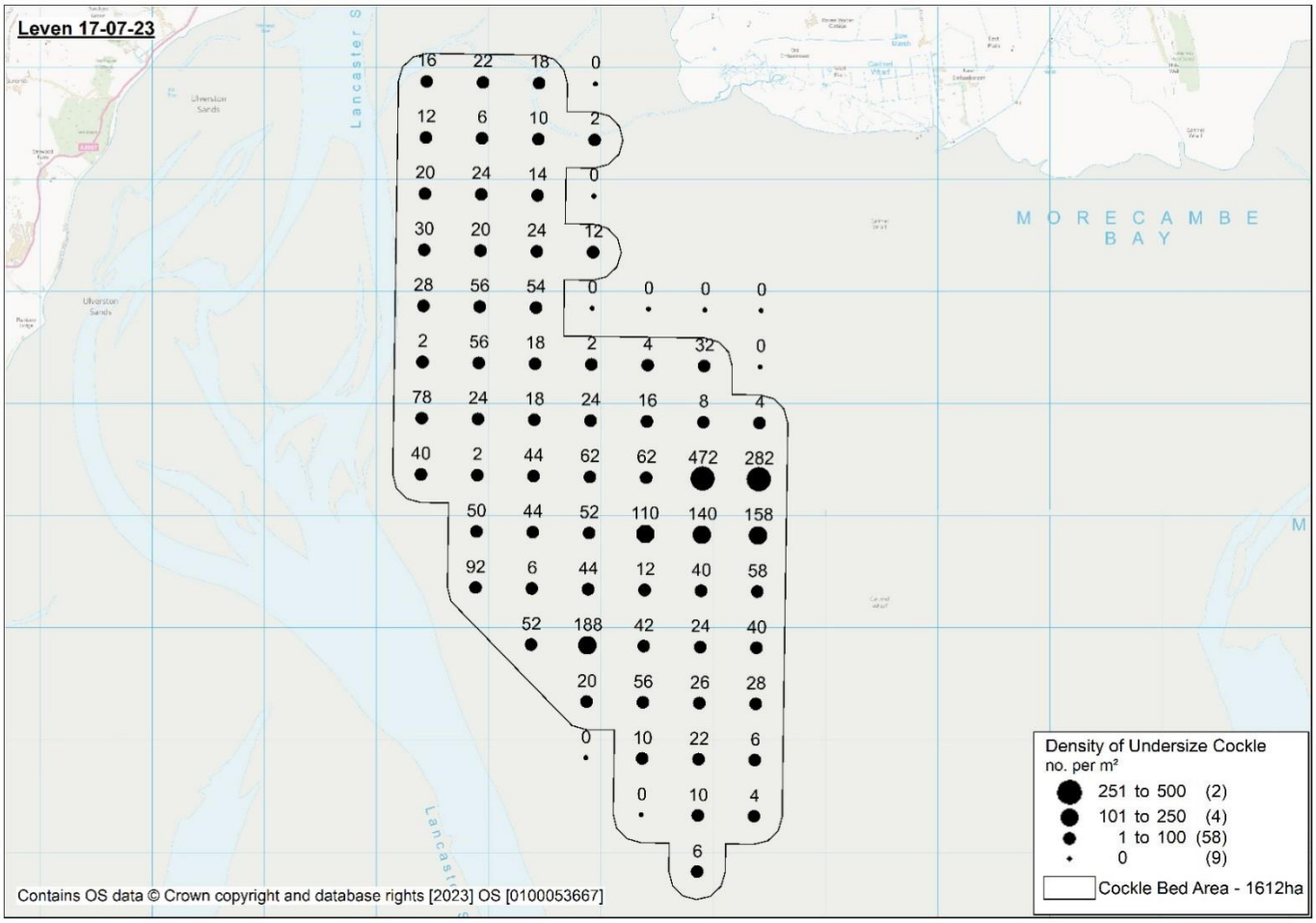


Figure 3. Density of undersize cockle per m² Leven July 2023

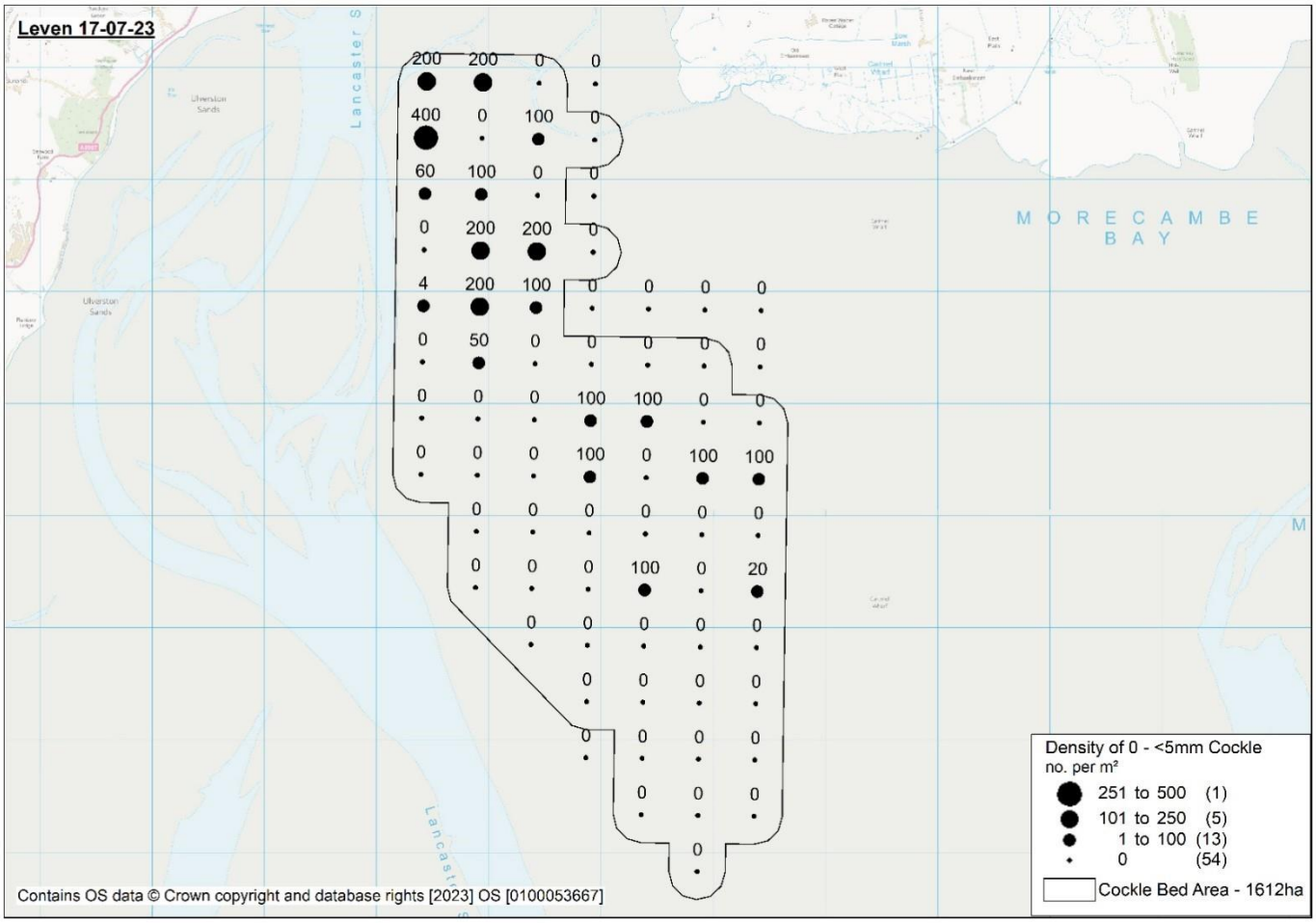


Figure 4. Density of 0-5mm cockle per m² Leven July 2023

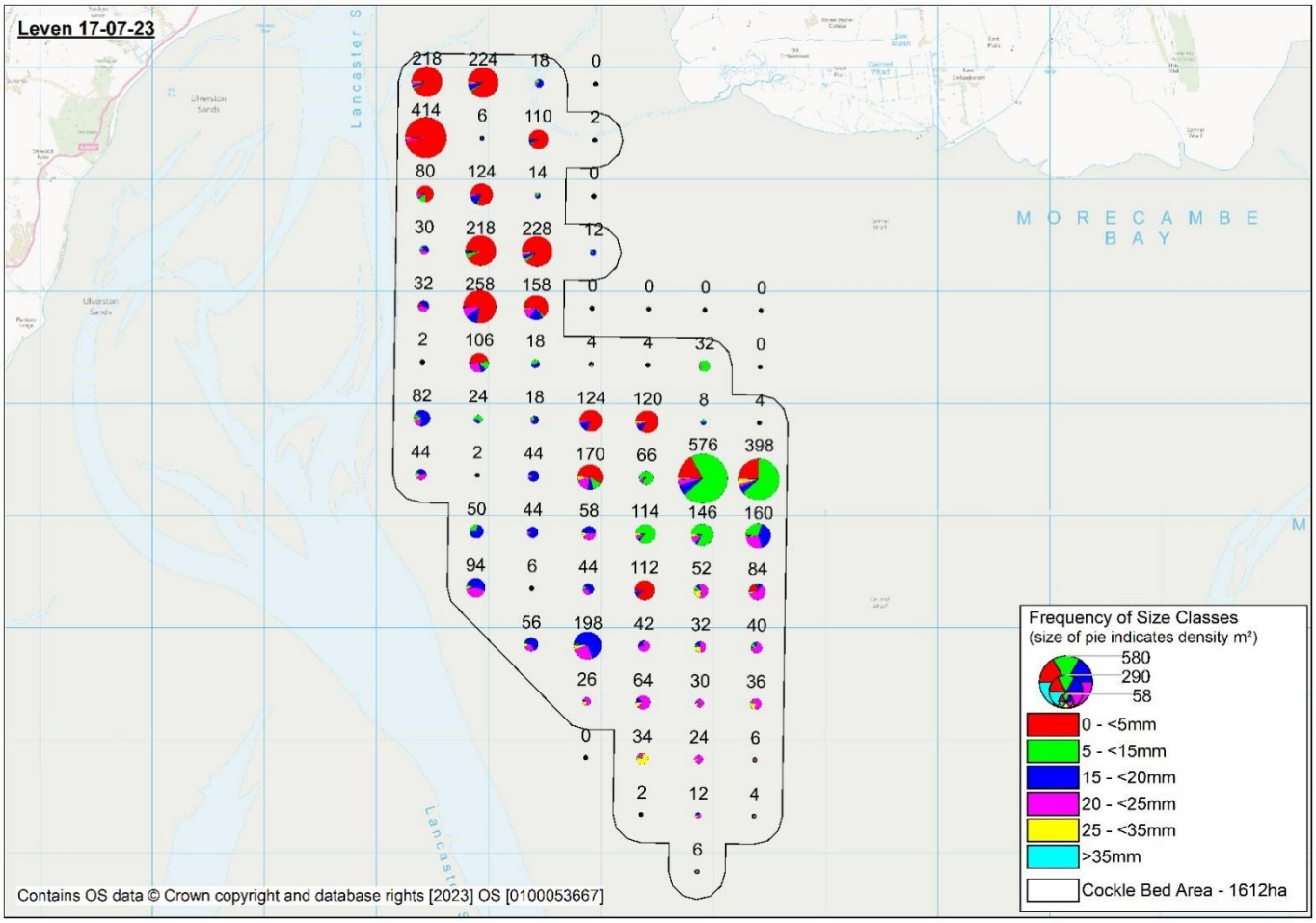


Figure 5. Frequency of size classes of cockle per m² Leven July 2023

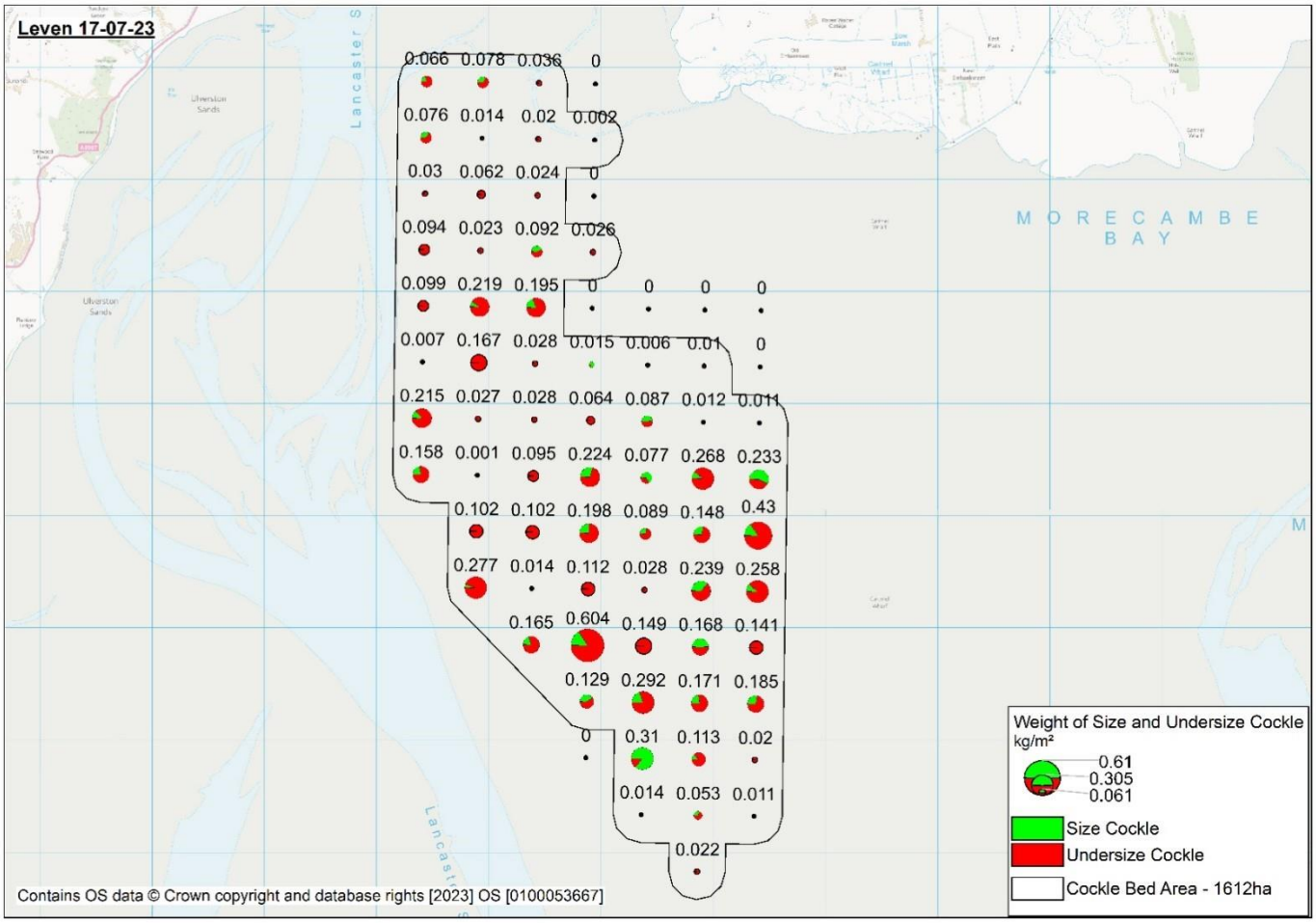


Figure 6. Weight of size and undersize cockle kg/m² at Leven July 2023.

Pilling Sands Cockle Survey 10-07-23

Officers present: AG, GE, AP, GG
Tides: LW 12:03 1.9m (Liverpool tides)

Survey method - Jumbo and 0.5m² quadrat

80 stations were sampled from a 500m grid. The majority of the cockle is between 15-20mm in length from a 2022 cockle settlement. Size cockle is relatively low in density across the bed. There is evidence of a 2023 cockle settlement across a number of survey stations.

Means

Means were calculated from all stations with zero counts on the edge of the bed removed. Less than 5mm cockle was not used in the undersize figures due to the high variable survivability of cockle at this small size but has been included as a separate figure.

Mean number of size cockle	6 per m²	(min 0, max 28)
Mean number of undersize cockle	140 per m²	(min 0, max 3000)
Mean number of 0-5mm cockle	5 per m²	(min 0, max 106)
Mean weight of size cockle kg/m²	0.055 kg/m²	(min 0, max 0.250)
Mean number of undersize cockle kg/m²	0.326 kg/m²	(min 0, max 7.090)

Maps

Maps were created showing the overall survey area, density of size cockle, density of undersize cockle (excluding cockles in the 0-5mm size range, the frequency of size classes, the size of the pie chart indicates the total density of cockles present, and the weight of undersize and size cockle.

Biomass

	Area (ha)	Size Cockle (tonnes)[1]	Undersize Cockle (tonnes)[2]
Pilling Sands	**1475**	**800**	**4800**

[1]In regards to biomass size cockle defined as cockle which will not pass through a square gauge 20 x 20mm in size.
[2]The biomass of undersize cockle does not include any estimates of cockle less than 5mm due to the high variability of survival of this size class.

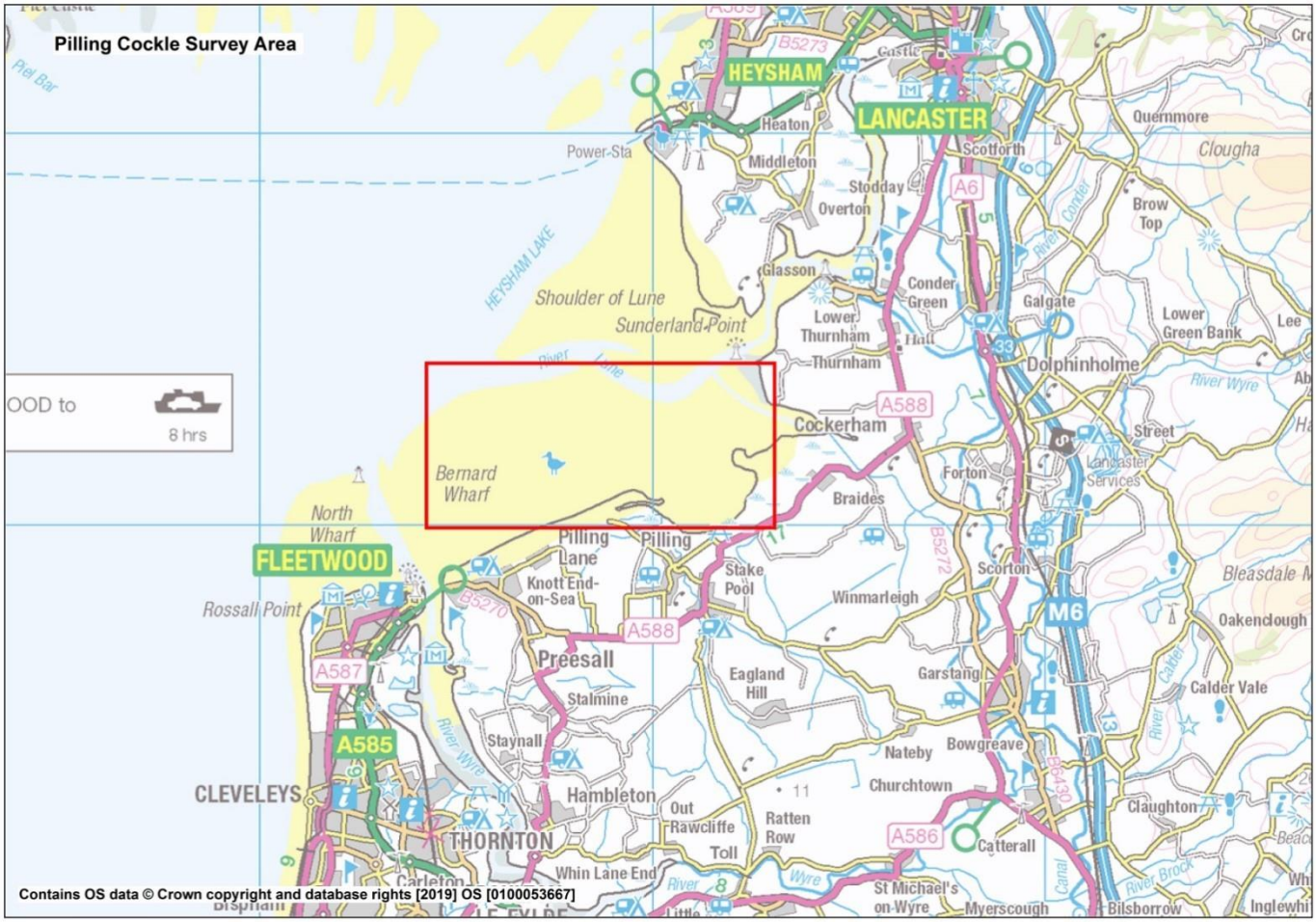


Figure 1. Illustration of position of Pilling Sands Survey Area

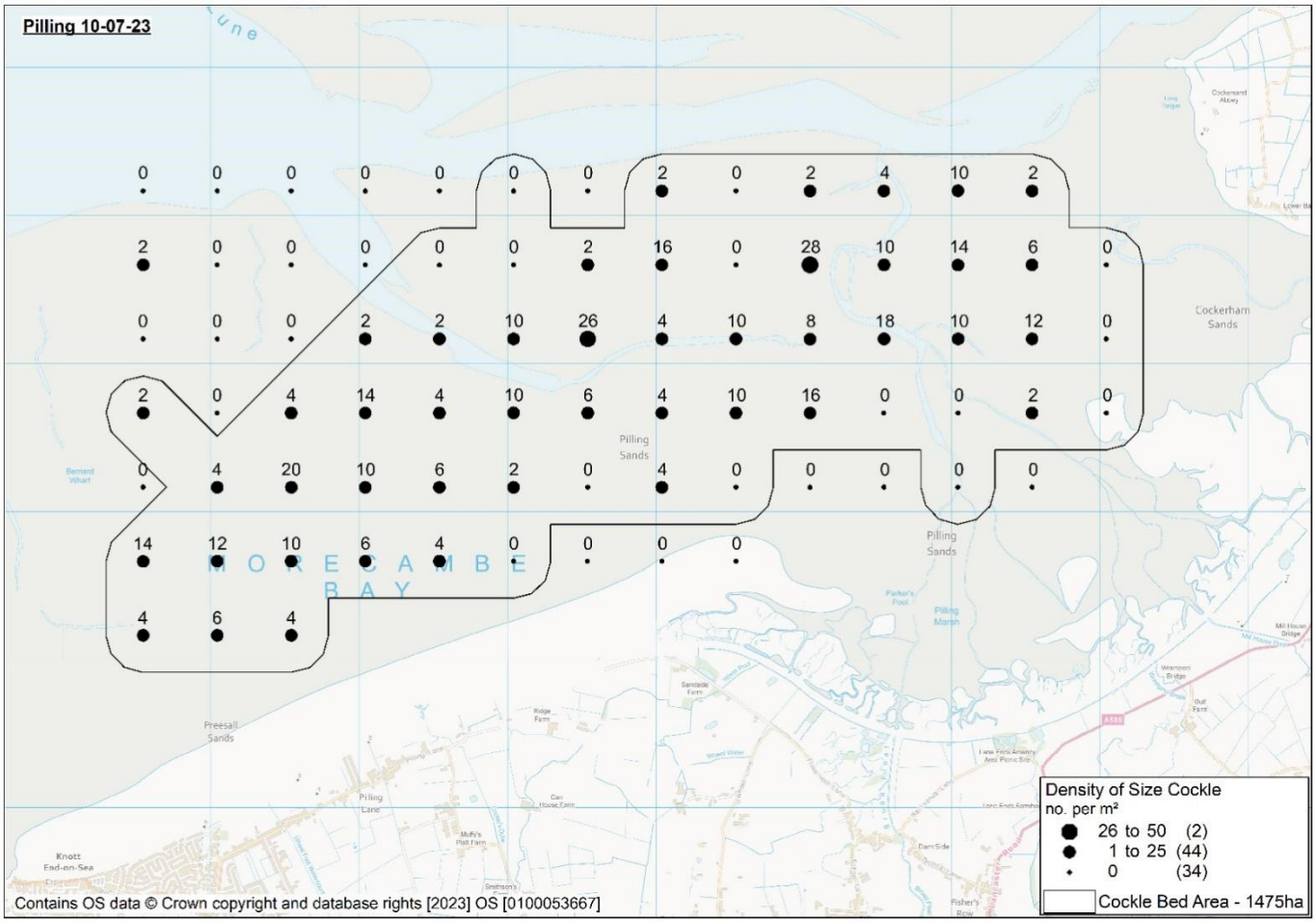


Figure 2. Density of size cockle per m² at Pilling Sands July 2023

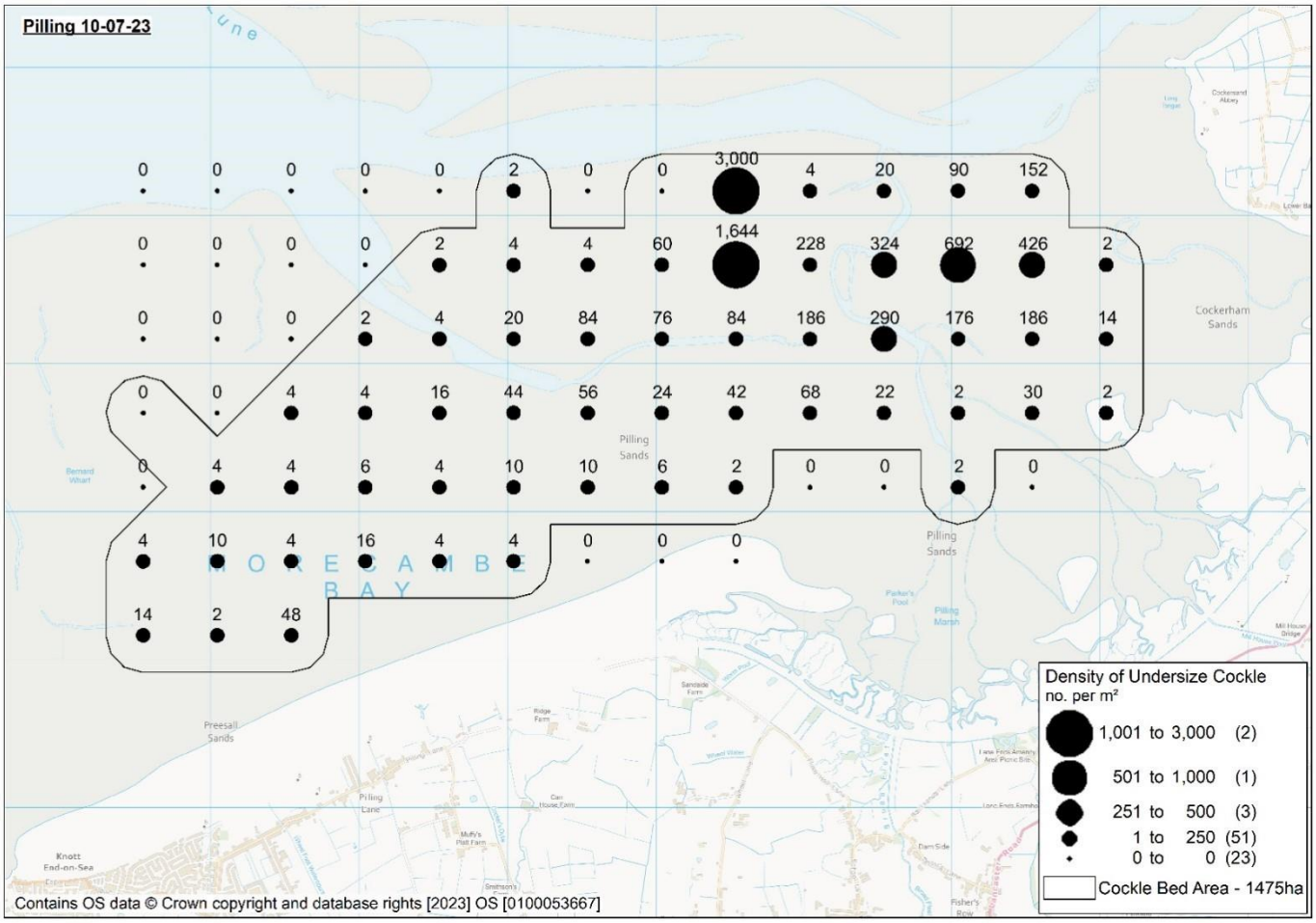


Figure 3. Density of undersize cockle per m² at Pilling Sands July 2023

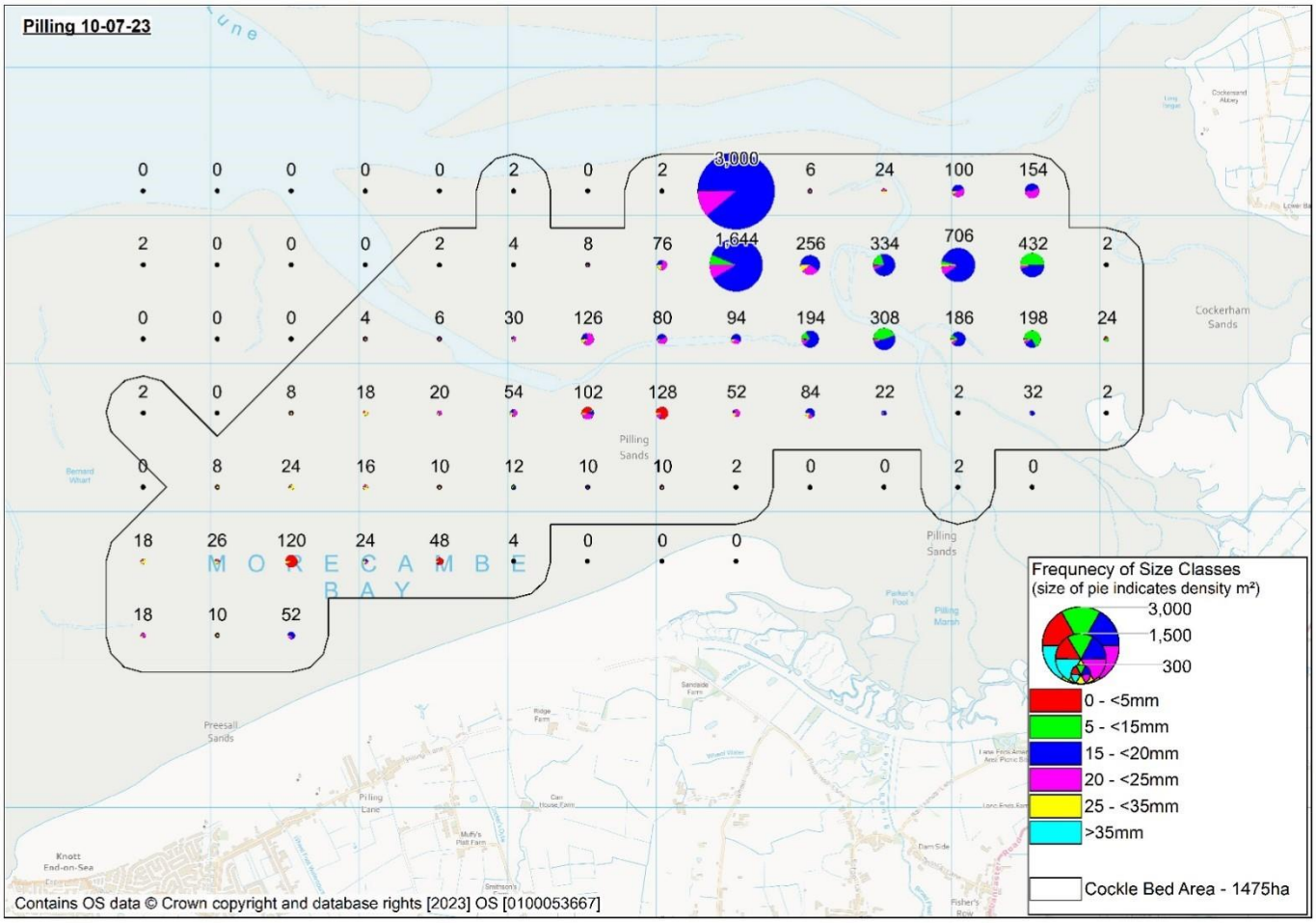


Figure 5. Frequency of size classes of cockle per m² at Pilling Sands July 2023

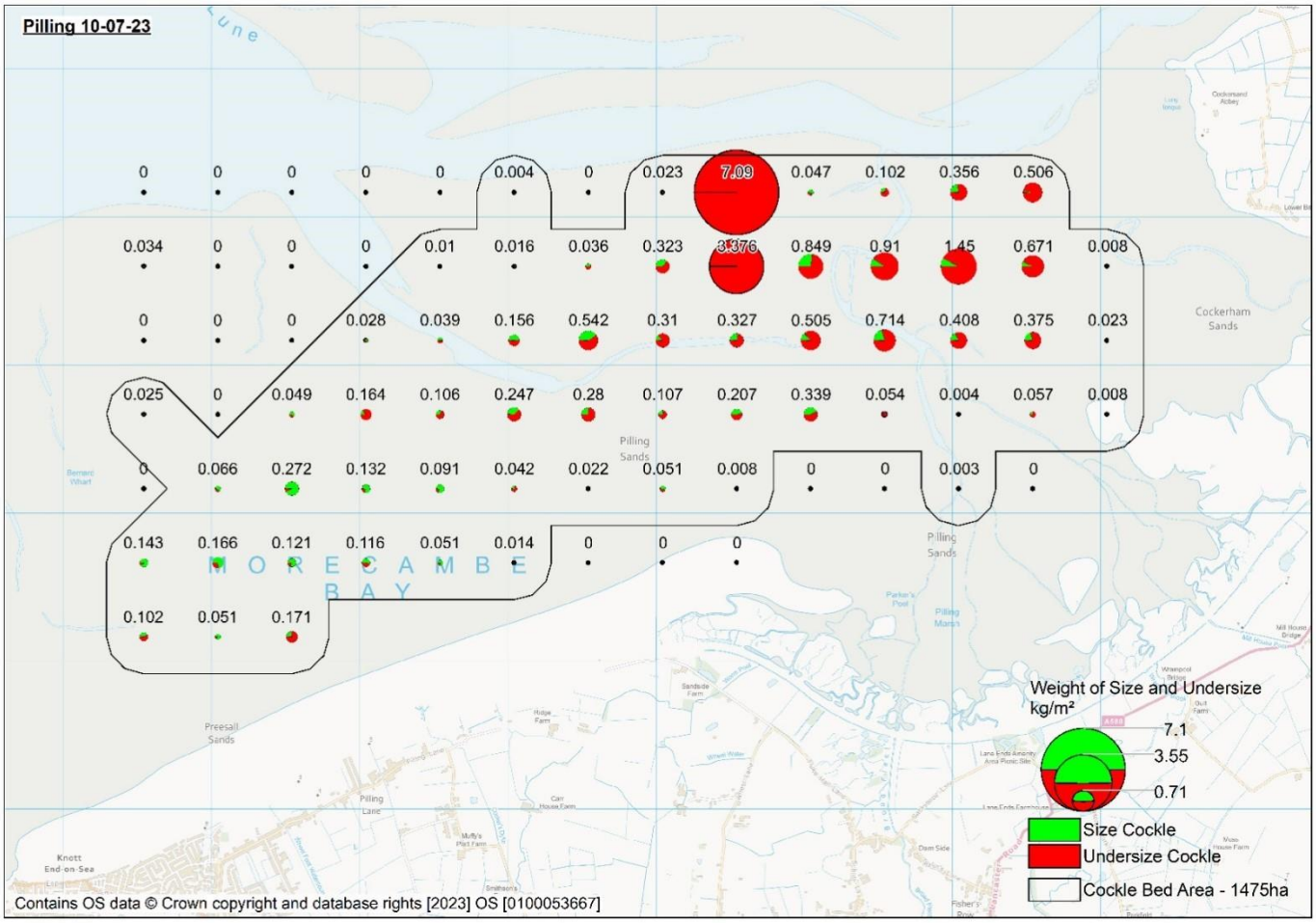


Figure 6. Weight of size and undersize cockle kg/m² at Pilling Sands July 2023.

Warton Sands Cockle Inspection 15-06-22

Officers Present: JH, GG

Tides: LW 16:18 1.7m (Liverpool Tides)

An inspection of the cockle bed at Warton Sands was undertaken to monitor presence and density of cockle in the area which had previously been surveyed and assess if a full survey is required. Much of the area is inaccessible due to a change in the Keer channel. There has been considerable scouring with previously buried object 2.5m above the surface (Figure 1). As such there is very little cockle present. Due to the small area, limited access to areas, and lack of cockles a return survey is not planned in 2023.

Fig 1 – Previously buried structure, now 2.5m above surface

Middleton Cockle Survey 20th and 25th July 2023

Officers present:	MT, AG, JH, MC		
Tides:	20-07-23	LW 20:08	2.2m (Liverpool tides)
	25-07-22	LW 11:04	2.7m (Liverpool tides)

Survey method - Jumbo and 0.5m² quadrat

78 stations were sampled from a 350m grid. There was a wide range of cockle sizes across the bed from < 5mm to 35mm. Size cockle is relatively low in density but present across most of the bed. There is evidence of a 2023 cockle settlement across a number of survey stations.

Means

Means were calculated from all stations with zero counts on the edge of the bed removed. Less than 5mm cockle was not used in the undersize figures due to the high variable survivability of cockle at this small size but has been included as a separate figure.

Mean number of size cockle	8 per m²	(min 0, max 42)
Mean number of undersize cockle	24 per m²	(min 0, max 212)
Mean number of 0-5mm cockle	29 per m²	(min 0, max 300)
Mean weight of size cockle kg/m²	0.064 kg/m²	(min 0, max 0.250)
Mean number of undersize cockle kg/m²	0.043 kg/m²	(min 0, max 0.173)

Maps

Maps were created showing the overall survey area, density of size cockle, density of undersize cockle (excluding cockles in the 0-5mm size range) the density of the 0-5mm size class, the frequency of size classes, the size of the pie chart indicates the total density of cockles present, and the weight of undersize and size cockle.

Biomass

	Area (ha)	Size Cockle (tonnes)[1]	Undersize Cockle (tonnes)[2]
Middleton Sands	**732**	**475**	**325**

[1]In regards to biomass size cockle defined as cockle which will not pass through a square gauge 20 x 20mm in size.
[2]The biomass of undersize cockle does not include any estimates of cockle less than 5mm due to the high variability of survival of this size class.

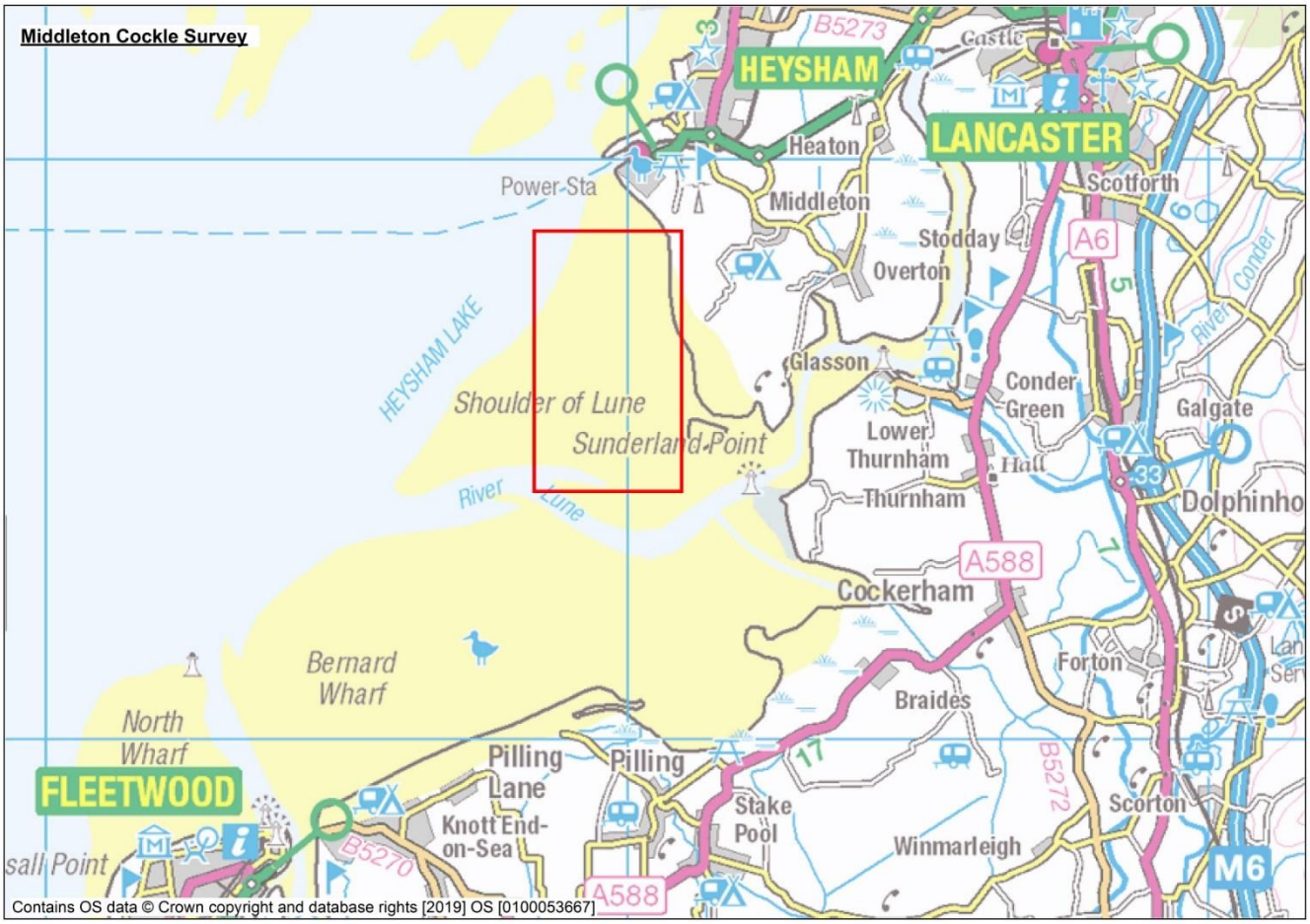


Figure 1. Illustration of position of Middleton Sands cockle bed

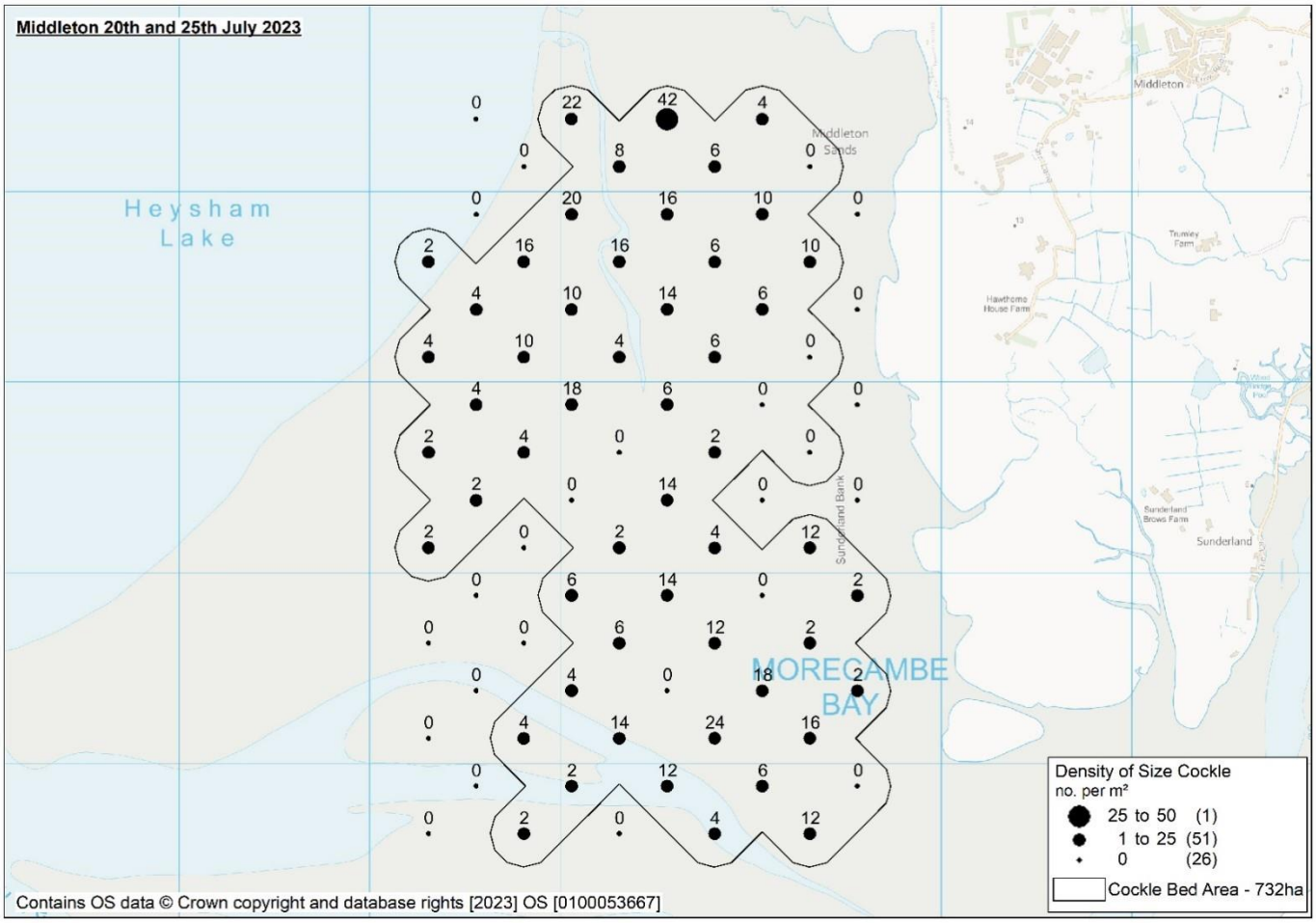


Figure 2. Density of size cockle per m² Middleton Sands July 2023

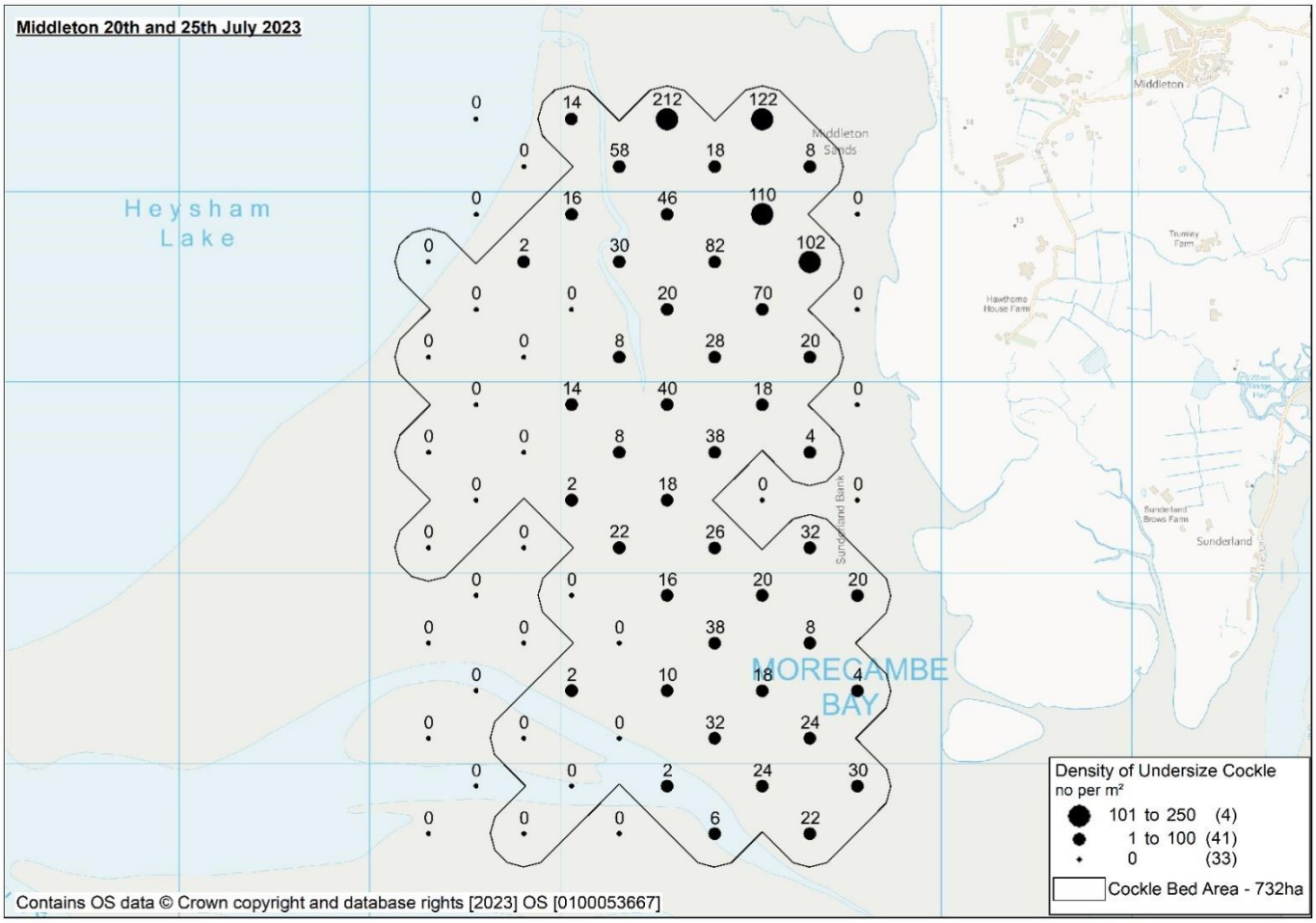


Figure 3. Density of undersize cockle per m² Middleton Sands July 2023

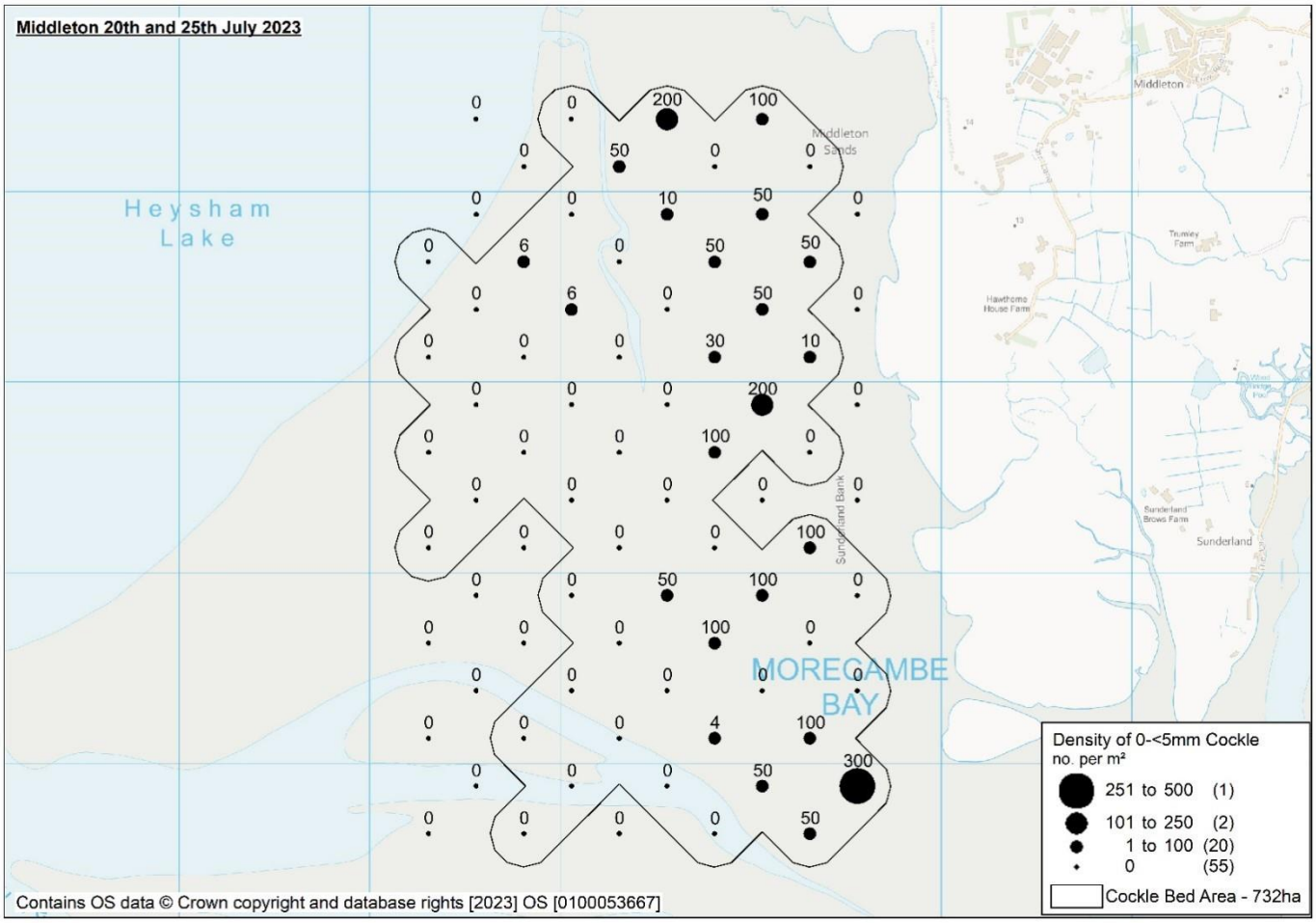


Figure 4. Density of 0-5mm cockle per m² on Middleton Sands July 2023

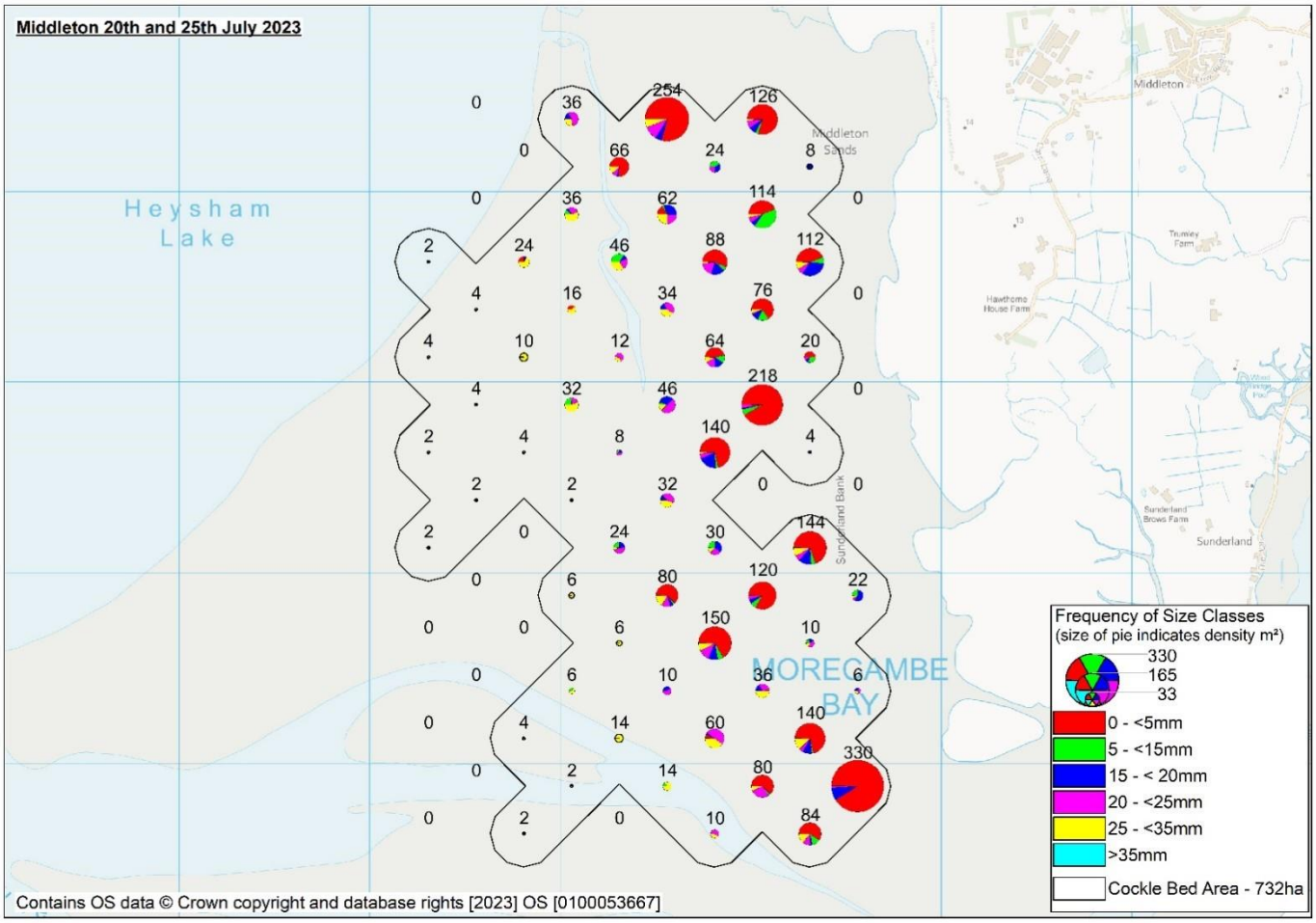

Middleton 20th and 25th July 2023
Heysham Lake
Middleton
Middleton Sands
Sunderland Bank
Sunderland
MORECAMBE BAY
Frequency of Size Classes
(size of pie indicates density m²)
330
165
33
0 - <5mm
5 - <15mm
15 - < 20mm
20 - <25mm
25 - <35mm
>35mm
Cockle Bed Area - 732ha
Contains OS data © Crown copyright and database rights [2023] OS [0100053667]

Figure 5. Frequency of size classes of cockle per m² Middleton Sands July 2023

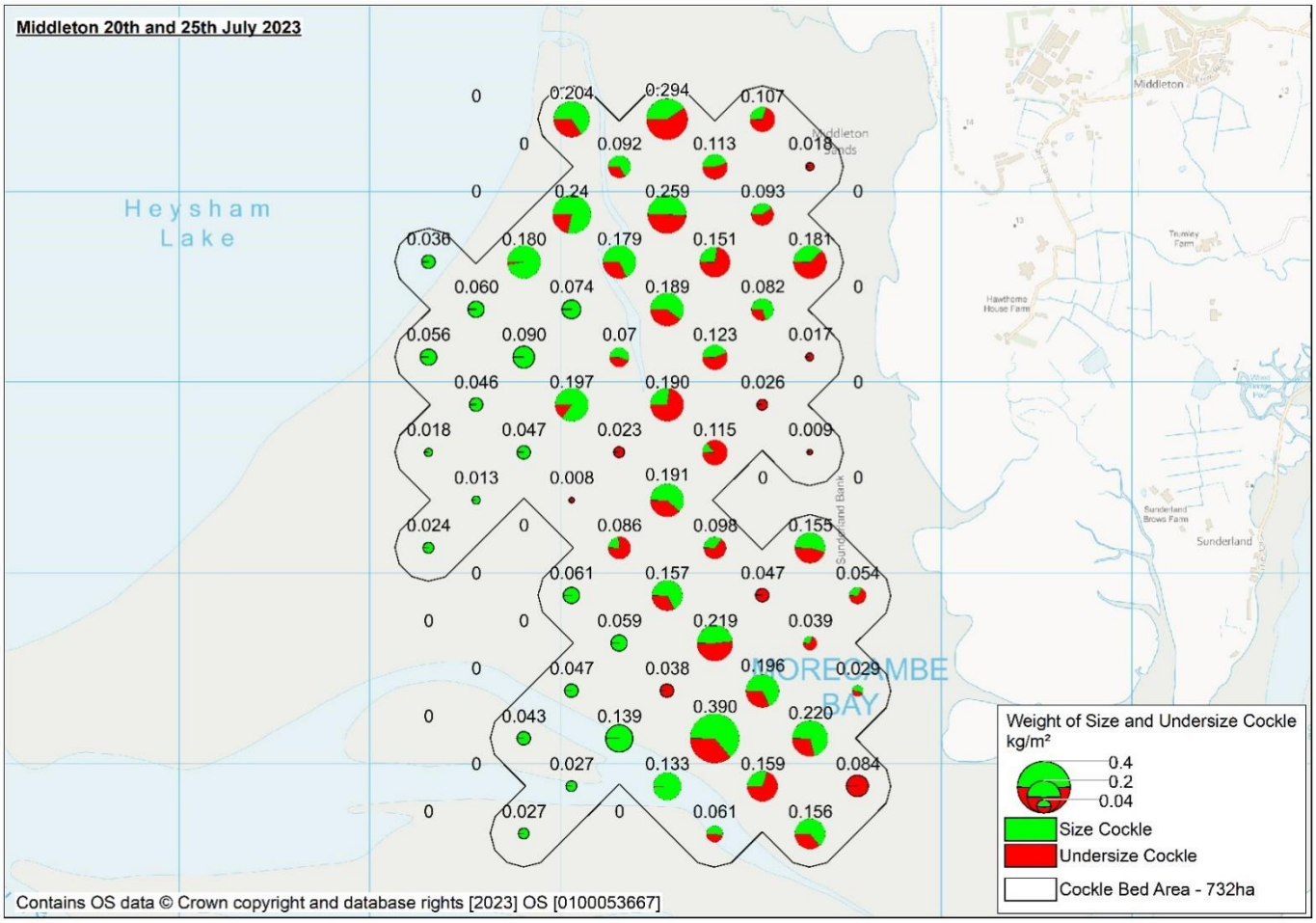
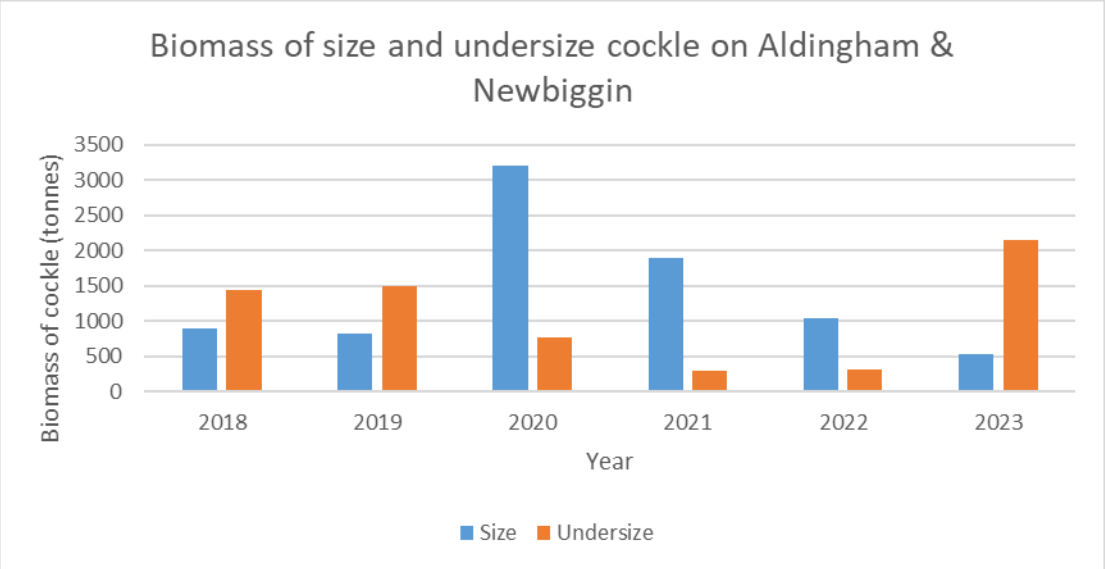
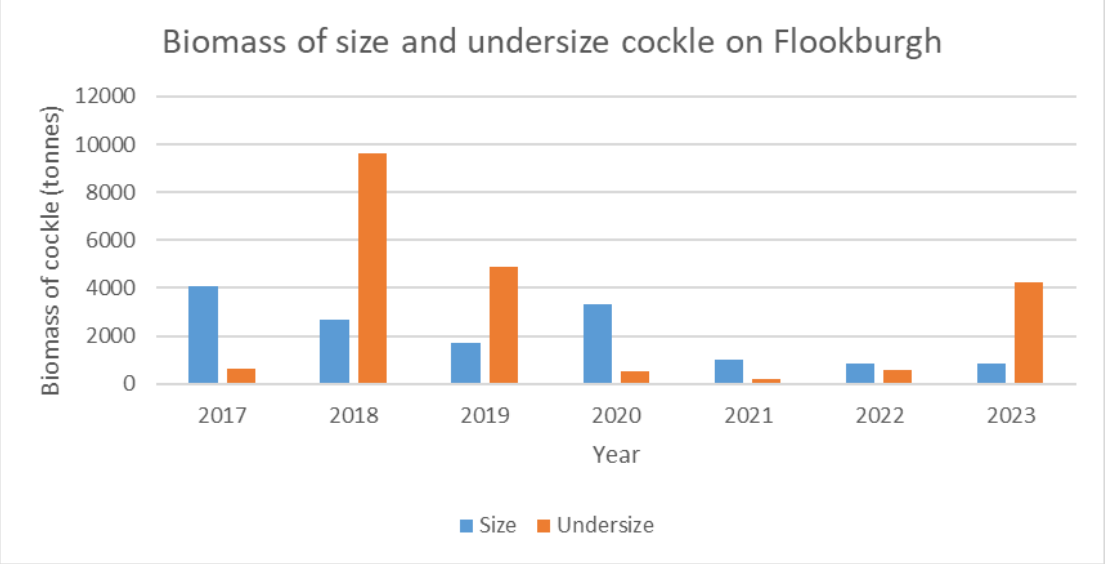
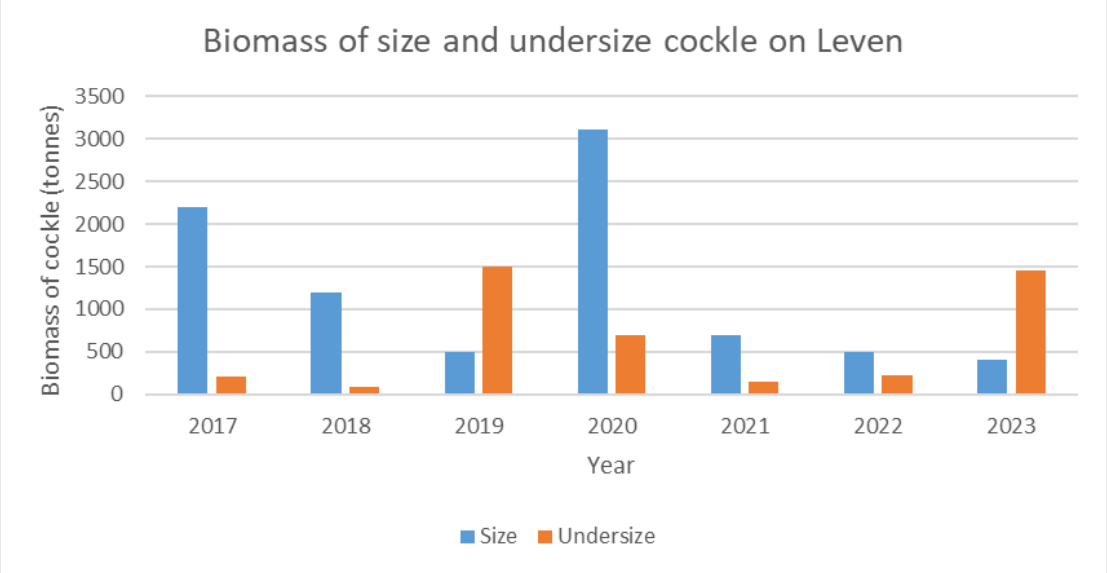


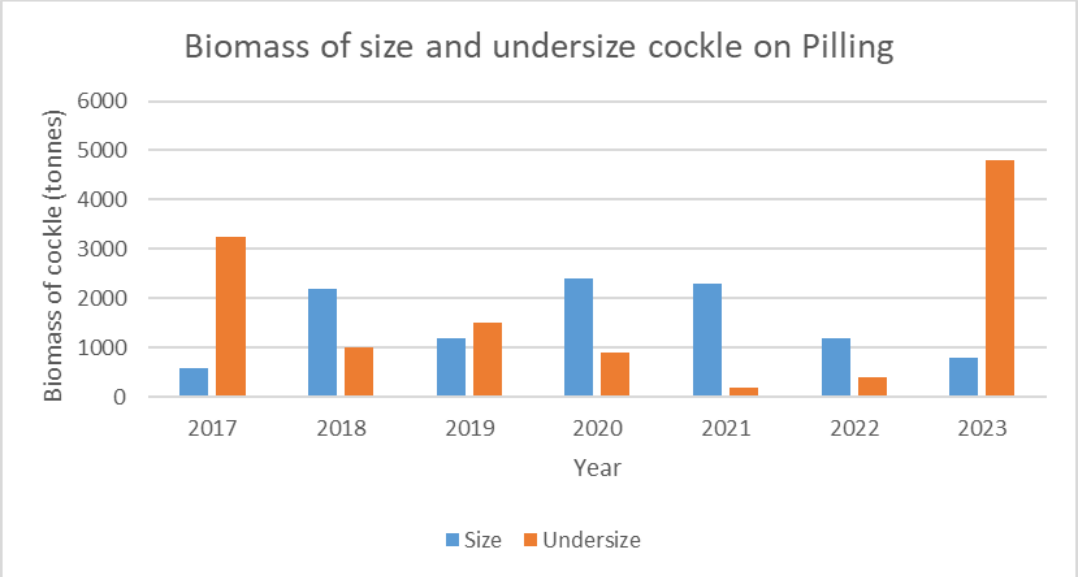
Figure 6. Weight of size and undersize cockle kg/m² at Middleton Sands July 2023.

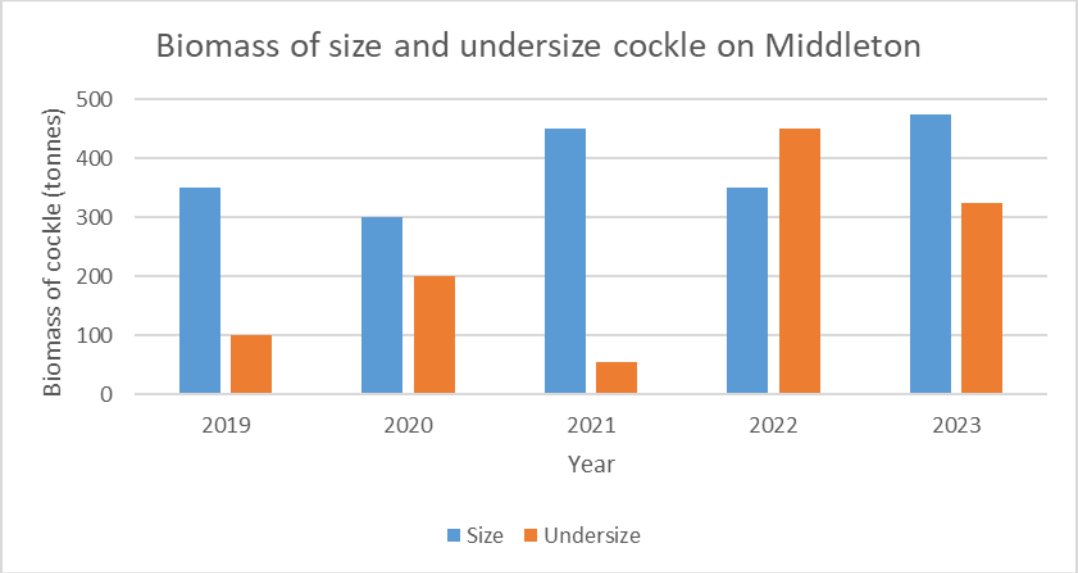
Annex 2.
Cockle survey results – individual cockle bed trends








Biomass of size and undersize cockle on Pilling
Biomass of cockle (tonnes)
6000
5000
4000
3000
2000
1000
0
2017
2018
2019
2020
2021
2022
2023
Year
Size
Undersize


Biomass of size and undersize cockle on Middleton
Biomass of cockle (tonnes)
500
400
300
200
100
0
2019
2020
2021
2022
2023
Year
Size
Undersize